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Binder 128, Leucochloridiidae A-Z [Trematoda Taxon Notebooks]

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FAMILY LEUCOCHLORIDIIDAE (POCHE, 1907) DOLLFUS, 1934

1. Subfamily Leucochloridiinae Poche, 1907

   Leucochloridium Carus, 1835

   Urogonimus Monticelli, 1888*

   Neoleucochloridium Kagan, 1951*

   Dollfusinus Biocca & Ferretti, 1958

2. Subfamily Urotocinae Yamaguti, 1958

   Urotocus Looss, 1899

3. Subfamily Urorygminae Yamaguti, 1958

   Urorygma Braun, 1901**

*Considered as synonyms of Leucochloridium by Yamaguti (1971).

**Considered as placed in genera incertae by Kagan (1952) until details of its life history shed light on its proper disposition.

FAMILY LEUCOCHLORIDIIDAE (POCHE, 1907) DOLLFUS, 1934

LEUCOCHLORIDIIDAE Dollfus, 1934

Family diagnosis: Digenea related to Brachylaimidae in general anatomy and life cycle pattern. Body small, oval to lanceolate. Oral sucker strongly developed, with apical mouth aperture; pharynx well developed; esophagus very short or practically absent; ceca simple, terminating at or near posterior extremity. Acetabulum large or small, at varying levels. Testes tandem, diagonal or juxtaposed, usually in posterior part of body, rarely in forebody. Cirrus pouch present. Genital pore at posterior extremity. Ovary intertesticular or opposite anterior testis, rarely posttesticular. Seminal receptacle absent or formed by dilation of Laurer's canal. Vitellaria follicular, extending in lateral fields for greater part of body or confined to forebody. Uterus intercecal, may overreach ceca laterally and anteriorly; eggs small, numerous. Excretory system as in Brachylaimidae. Cercaria produced in branched sporocyst in land snails, tailless, enclosed in mucoid membrane in same sporocyst in which it developed. Parasites of birds, exceptionally of mammals.

Key to subfamilies of Leucochloridiidae from birds

1. Body elongate, linguiform; suckers poorly developed; vitellaria extending in fore- and hindbody ..... Urotocinae
   Body oval to elliptical; suckers strongly developed 2
2. Testes in forebody; ovary dorsal to acetabulum; vitellaria confined to forebody .... Urorygminae
   Testes and ovary in hindbody; vitellaria extending in fore- and hindbody ..... Leucochloridiinae

– Yamaguti (1971)

1. Corps allongé, ventouses faiblement développées..... *Urotocus*
— Corps elliptique, oblong ou ovale ; ventouses grandes 2
2. Viteliogènes courts, atteignant le niveau du testicule postérieur. Utérus n'entourant pas l'acetabulum. Cirre court et trapu. *Urogonimus*
— Vitellogènes atteignant l'extrémité postérieure du corps. Utérus entourant l'acetabulum, passant entre l'acetabulum et le pharynx. Glandes génitales disposées en triangle 3
3. Utérus extra-cæcal ; cirre long et étroit, lisse ou épineux..... ..... *Leucochloridium*
— Utérus extra-cæcal ; cirre long avec rugosités.... *Neoleucochloridium*

– Timon-David (1957) after Kagan (1952)

LA VARIABILITÉ DES SIGNES MORPHOLOGIQUES ET SON IMPORTANCE DANS LA CLASSIFICATION DES TRÉMATODES

par I. E. Bykhovskaia-Pavlovskaia (Léningrad)

Les trématodes sont une des classes les mieux étudiées des vers parasites. Cependant leur classification est très en retard sur les connaissances qu'on possède sur eux, car, dans la plupart des cas, elle se fonde sur les signes morphologiques purement extérieures sans tenir compte de leur variabilité naturelle; on perd de vue la propriété des parasites, comme celle de tous les êtres vivants en général, de se modifier suivant l'âge et au cours de leur adaptation aux conditions d'existence. On décrit souvent les nouvelles espèces d'après un seul ou deux exemplaires, qui quelquefois même n'ont pas atteint la maturité sexuelle. Ceci conduit à un encombrement du système actuel par une multitude d'espèces artificiellement créés, et ce système ne représente dans sa plus grande partie qu'un "catalogage" plus ou moins heureux des formes.

L'étude de 900 spécimens de vers du genre *Leucochloridium* Carus, d'âge différent, pris chez 30 espèces d'oiseaux, m'a permis de vérifier sur des séries nombreuses le degré de constance de différents caractères morphologique et d'apprécier leur valeur taxonomique.

Les caractères suivants ne peuvent pas être reconnus comme critériums systématiques des espèces du *Leucochloridium*: position de la ventouse orale, dimensions relatives de pharynx, épaisseur des branches de l'intestin, limite antérieure de l'étendue des vitellaria, forme et dimensions aussi bien absolues que relatives des glandes génitales, degré de leur rapprochement ou de leur éloignement l'une de l'autre.

On peut considérer comme caractères fondamentaux et constants la limite postérieure de l'étendue des vitellogènes, la position de l'utérus par rapport à l'espace interintestinal, la disposition relative des glandes génitales.

A la suite d'une révision critique de la classification de toutes les espèces du genre, avec une réévaluation correspondante des caractères, j'ai mis en synonymie 18 espèces et rétabli une espèce. Actuellement, le genre est représenté par 10 espèces. Nombre d'espèces décrites par McIntosh chez les oiseaux de l'Amérique du Nord et certaines espèces japonaises décrites par Yamaguti se sont montrées identiques aux espèces européennes.

Certaines espèces du genre sont spécifiques pour certains ordres d'oiseaux, et le degré de cette spécificité est différent pour autant que celle-ci se définit par tout le complexe des facteurs biologo-écologiques du milieu d'habitation du parasite, en interaction avec ses particularités morpho-physiologiques.

Le trouvaille de parasites chez des hôtes inhabituels plaide en faveur de la relativité de la notion "spécificité". La spécificité du parasitisme n'est pas une relation définie une fois pour toutes entre le parasite et son hôte: elle peut se modifier en même temps que se modifie sa biologie; par conséquent, il ne faut pas exagérer son importance lorsqu'on détermine la position systématique de telle ou telle espèce.

From: Proc. Internat. Congr. Zool. (XIV) 14: 363-364 (1956)

The following key will aid in distinguishing the known species of *Leucochloridium*: From McIntoshe, 1932

1. Acetabulum pre-equatorial; uterus confined to intercecal area; vitellaria extending posteriorly beyond level of posterior testis 2
   The above combination of characters not present 5
2. Over 5 mm. long; testes lobed ..... *L. flavum* Trav.
   Less than 5 mm. long; testes oval or spherical 3
3. Ovary post-testicular ..... *L. cercatum* (Mont.)
   Ovary anterior to zone of posterior testis 4
4. Genital pore ventral; ovary and testes spherical; ovary occupying a part of zone of anterior testis ..... *L. turanicum* (Sol.)
   Genital pore dorsal; ovary and testes elliptical; ovary and anterior testis occupying separate zones[3] ..... *L. sorae* McI.
5. Ovary and testes arranged in a triangle 6
   Ovary and testes arranged more or less in a linear series 16
6. Diameter of ovary about one-half that of testes 7
   Diameter of ovary about equal to that of testes or larger 8
7. Vitellaria not extending posteriorly beyond zone of ovary ..... *L. parcum* Trav.
   Vitellaria extending posteriorly beyond zone of ovary, usually to tip of cecum or beyond ..... *L. pricei* n. sp.
8. Vitellaria extending well beyond zone of posterior testis into posterior tip of body to area of cirrus pouch 9
   Vitellaria not extending to tip of body, usually ending at or before reaching zone of posterior testis 12
9. Vitellaria extending anteriorly only to level of pharynx; uterus circling acetabulum and not extending anteriorly beyond bifurcation of intestine ..... *L. insigne* (Looss)
   Vitellaria extending anteriorly beyond level of pharynx; uterus not circling acetabulum but extending on each side of body anteriorly beyond bifurcation of intestine 10
10. Anterior testis and ovary separated by a distance equal to, or less than, longitudinal diameter of either of these organs; ovary and anterior testis with their zones partly overlapping or entirely so; transverse diameter of pharynx usually less than longitudinal diameter of ovary ..... *L. actitis* n. sp.
    Anterior testis and ovary separated by a distance equal to, or greater than, longitudinal diameter of either of these organs; transverse diameter of pharynx greater than longitudinal diameter of ovary 11
11. Fecundarium conspicuous; ovary and pharynx with a transverse diameter ratio of 5 : 8 ..... *L. variae* n. sp.
    Fecundarium inconspicuous; ovary and pharynx ratio about 5 : 6 *L. cyanocittae* n. sp.
12. Vitellaria extending posteriorly as far as tip of intestine 13
    Vitellaria not extending posteriorly as far as tip of intestine 14
13. Fecundarium well developed ..... *L. melospizae* n. sp.
    Fecundarium indistinct ..... *L. macrostomum* (Rud.)
14. Distance separating posterior testis from tip of body much less than distance separating anterior testis from acetabulum ..... *L. vireonis* McI.
    Distance separating posterior testis from tip of body about equal to, or greater than, distance separating anterior testis from acetabulum 15

[3] *L. hypotaenidiarum* Tubangui, 1932, will key out with *L. sorae;* the two species are very similar, as Tubangui (1932) has pointed out.

15. Vitellaria extending for some distance anteriorly beyond bifurcation of intestine along each side of oral sucker ..... *L. icteri* McI.
    Vitellaria not extending anteriorly beyond level of bifurcation of intestine ..... *L. dasylophi* Tub.
16. Testes large, about twice diameter of ovary ..... *L. certhiae* McI.
    Testes with a diameter about equal to, or less than, that of ovary 17
17. Uterus extending anteriorly into the area lateral to oral sucker *L. dryobatae* n. sp.
    Uterus not extending anteriorly into the area lateral to oral sucker 18
18. Anterior testis overlapped ventrally on its anterior margin by acetabulum; fecundarium well developed ..... *L. mniotiltae* McI.
    Anterior testis usually posterior to zone of acetabulum; fecundarium not developed ..... *L. seiuri* n. sp.

This key is out of date and includes species of Leucochloridium, Urogonimus and Neoleucochloridium plus some species which Kagan (1952) considers to be synonyms — P.D.L.

In the key, as well as in the descriptions of the species, the writer has used extensively the distribution of the vitellaria and the arrangement of the reproductive glands in separating and characterizing the different species. The position and the arrangement of the reproductive glands may, and doubtless do, often vary in the different individuals of a species. Such variations of the reproductive glands, due to body contractions or possible disarrangement by the gravid coils of the uterus, are confusing and may lead to error in separating species. In the majority of cases, however, where a large number of specimens were taken from a single host, the individuals of a single species were found to be fairly uniform and similar in general appearance.

References

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SUBFAMILY LEUCOCHLORIDIINAE POCHE, 1907

Subfamily diagnosis: Leucochloridiidae. Body oval, with rounded or attenuated ends. Cuticle smooth or spined. Suckers strongly developed. Acetabulum situated in middle third of body or a little more anteriorly or posteriorly. Testes more or less diagonal or subsymmetrical, near posterior extremity. Cirrus pouch at extreme posterior end of body. Genital pore dorsoterminal. Ovary median or submedian, intertesticular, or rather opposite anterior testis. Vitellaria occupying most of lateral fields. Uterine coils may or may not extend beyond ceca. Excretory vesicle saccular. Parasitic in cloaca or bursa Fabricii of birds, occasionally in mammals.

Generic diagnosis: Leucochloridiidae, Leucochloridiinae, with acetabulum in middle third of body or a little more posteriorly, but not more anteriorly than in *Dolifustinus* parasitic in mammals.

-Yamaguti (1971)

GENUS LEUCOCHLORIDIUM CARUS, 1835

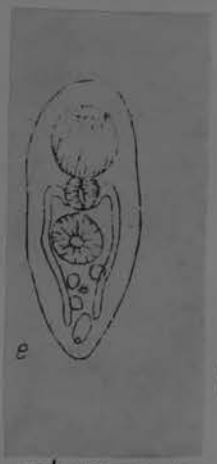
(Leucochloridiinae)

Generic diagnosis from Kagan (1952):

Leucochloridiinae: Body elliptical. Acetabulum and oral sucker well developed, muscular. Cuticula spinose or aspinose. Genital pore terminal or subterminal. Excretory pore opening close to genital pore. Laurer's canal opening into excretory bladder. Uterus ascending to level of oral sucker and passing over to other side of body between acetabulum and pharynx; metraterm glandular, thinwalled. Cirrus pouch large, muscular. Cirrus long, smooth or slightly spinose, tapering to a point. Genital glands in triangular configuration. Seminal receptacle present. Vitellaria extending to end of intestinal ceca or to terminal part of body. Parasites in digestive tract of passerine and shore birds. Type species: Leucochloridium paradoxum Carus, 1835 (=D. macrostomum of Zeller (1874), L. sp. Hsu, 1936, from Pavoncella pugnax).

[TYPE SPECIES]

Leucochloridium paradoxum Carus, 1835



metacercaria - after Pojmanska (1962)

Leucochloridiidae
~~Brachylaemidae~~

Leucochloridium americanum Dall, 1892

"A singular sausage-shaped parasite, of which one end is attenuated into a slender tube, is found in *Succinea*. The soft parts of the snail thus affected are much distorted. The parasite is one phase of a Distome or fluke-worm, and is of a dark brown color and over an inch in length. It is known as *Leucochloridium americanum* Dall. An analogous species has been described from French Succineas, which is of a mottled green. This parasite attains its development in the intestines of thrushes which feed on Succineæ, and may perhaps be fatal to these birds."

—a nomen nudum
—P.D. Lewis

FROM: [1] Dall, W. H., "Instructions for Collecting Mollusks and Other Useful Hints for the Conchologist," U. S. National Museum, Bull. 39, Part G, 1892, p. 10.

Since Dall gave the specimen a name some consideration of it is necessary. It is of course impossible to identify the worm since he did not describe it. The sporocyst was evidently more than one inch in length. The only other descriptive statement is that it "is of a dark brown color." If one is to construe this expression to mean that the sporocyst is solid brown, it is certainly not *Leucochloridium problematicum* Magath. From the text it seems to me one can not assume anything else.

FROM MAGATH, 1921

TWO OTHER EARLY RECORDS OF LEUCOCHLORIDIUM IN AMERICA:

Bryant Walker[3] refers to a *Leucochloridium* species as follows:

S. ovalis Gld. Abundant everywhere. This species is occasionally infested by a species of Leuchchloridium similar to the *L. paradoxum* Carus, found in the *S. putris L.* of Europe and figured by Baudon in *Jour. de Conch.*, V., 27, Pl. X., Fig. 6. In the same journal (V. 28, p. 205) is published a note from the late Thomas Bland, recording a similar occurrence in a specimen of *S. obliqua* Say.

Finally Hanham[4] states:

Succinea obliqua Say (St. Charles River). . . . In cleaning some of these shells taken on November 8, 1891, a few of the finest living specimens contained peculiar parasite, reference to which is made by Dr. Dall in his useful pamphlet "Instructions for Collecting Mollusks, etc.," (*Leucochloridium*).

[3] Walker, B., "The Shell-bearing Molluscs of Michigan," *Nautilus*, 1892, VI., 18.
species as follows:
[4] Hanham, A. W., "Notes on the Land Shells of Quebec City and District," *Nautilus*, 1897, X., 102.

CITED BY MAGATH, 1921

Leucochloridium australiense Johnston & Cleland, 193

syn: L. australiense Johnston + Simpson, 1940.

THE CERCARIAEUM

About twenty fully developed cercariaea were found in the large pulsating sac. Each was enclosed within a thick gelatinous sheath (fig. 2) interrupted at both the anterior and ventral suckers. In the outer part of the sheath [illegible] concentric and radial lines were seen.

Each cercariaeum (figs. 1, 2, 4) was capable of much contraction and expansion, and a typical one was 616 μ long and 347 μ broad when contracted, and 308 μ broad when extended. The almost circular anterior sucker, which was surrounded by an elevated margin more pronounced dorsally, measured 193 μ across, and the mouth was subterminal on its ventral surface just behind the tip. A powerful, almost circular, pharynx, 69 μ long, was present, and from its dorsal aspect arose a very short oesophagus. This divided almost immediately to form the two intestinal caeca which arched upwards and outwards, and then passed backwards on either side of the ventral sucker to the level of the genital pore.

The ventral sucker lying in the anterior part of the second half of the body was 154 μ in diameter. The anterior sucker, pharynx and ventral sucker (figs. 11, 12, 20) were formed of radiating muscle fibres associated with large vacuolate myoblasts with prominent nuclei. Circular sphincter-like and longitudinal to oblique muscle fibres were present just beneath the cuticle, while internally to the radial fibres they were most strongly developed. At the junction of the anterior sucker and pharynx the circular fibres were much more numerous, and at the rim of the two suckers were grouped to form sphincters.

The intestine was lined by cuticle and cuboidal cells, and beyond the latter a few circular muscle fibres.

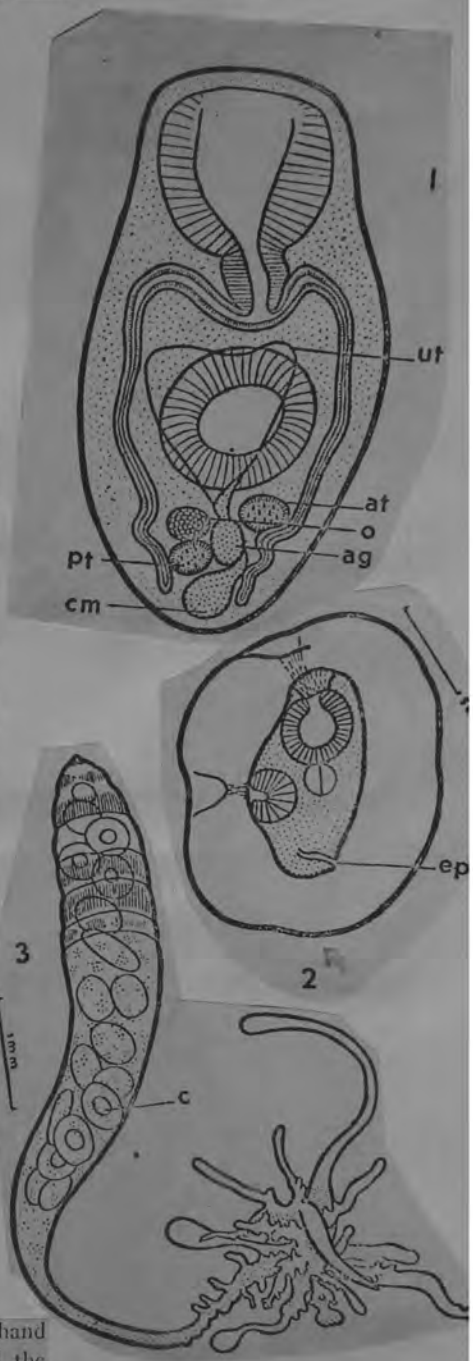
The general body surface was covered with a thick cuticle, but no trace of cilia was seen, though Magath (1920) and Zeller (1874) reported their presence in other species. Underlying the cuticle were circular, longitudinal and oblique muscle fibres supported by large connective-tissue cells (fig. 15). Scattered muscle fibres were seen throughout the body.

The nervous system (fig. 11) was typical and consisted of two lateral brain masses, one on either side of the anterior sucker and pharynx and connected dorsally by commissures. A large ventral nerve could be traced backwards on each side, and the root of each narrow dorsal nerve was seen. The anterior sucker was supplied by nerves from the brain.

Sense cells (figs. 13, 14, 20) were present on the surface of both suckers and an occasional minute one was seen in the cuticle of the body surface in the level of the pharynx. They were specially prevalent at the edge of the mouth and varied considerably in size, the largest being at the base of the anterior sucker immediately before its junction with the pharynx. They were either stalked or sessile, and consisted of a central clear parenchymatous part (fig. 14), in which was embedded the nerve fibrils, the whole surrounded by a substance having the consistency and colour of the cuticle. Dorsally and laterally from the pharynx a small number of cells similar to these in size and structure and staining properties were seen embedded in the parenchyma, but it is difficult to account for their function in such a situation.

REPRODUCTIVE SYSTEM

The two oval testes were diagonally placed, the anterior on the right-hand side (as viewed through a compound microscope) a little distance behind the ventral sucker; the posterior slightly dorsal to it but on the left-hand side. Above the posterior testis and slightly dorsal and median to it was the oval ovary, the three gonads thus forming a triangle (figs. 1, 4). In some specimens the ovary was found lying slightly in front of the anterior margin of the anterior testis. From the posterior testis the vas efferens (fig. 17) passed obliquely upwards ventral to the ovary and was joined by the shorter duct from the anterior testis. From this point the vas deferens (figs. 8, 16) travelled backwards, then turned sharply dorsally and passed through an undifferentiated cell mass to open at the



-Johnston & Cleland (1938)

gonopore on the dorsal side of the animal (figs. 6, 19, 20) a short distance from the posterior end. No seminal vesicle or true cirrus could be seen. The undifferentiated cell mass (figs. 1, 4, 6, 19, 20) near the gonopore was large and surrounded the end parts of the uterus and of the vas deferens, and thus could not be described at this stage as a cirrus sac. It gradually tapered ventrally and anteriorly away from the gonopore and then became separated into two parts, one of which surrounded the vas deferens and the other the uterus.

The short oviduct (fig. 10) travelled towards the mid-line, where it was joined by Laurer's canal (figs. 7, 8, 9, 19, 20), which passed posteriorly to enter the excretory canal just before the latter reached the excretory pore. Magath (1920, 109, 111) reported that a similar condition was present in *L. problematicum*, and was described by Looss (1899) for *L. insigne*. Near the junction of Laurer's canal with the oviduct was a slightly swollen part of the canal, probably the anlage of the fecundarium. The oviduct, after its junction with Laurer's canal, turned ventrally and was then joined by a very short vitelline duct (figs. 8, 9) which passed backwards to become widened into a small reservoir receiving the two yolk ducts. The latter ducts curved ventrally and anteriorly to the slightly developed yolk glands lying laterally from the intestinal caeca. Surrounding the oviduct, yolk reservoir and fecundarium was a large mass of undifferentiated tissue, the albumen gland (figs. 1, 4, 7-10).

After its junction with the yolk duct, the oviduct continued to the mid-ventral line, where it passed forwards into the ascending uterus (figs. 8, 9). This travelled upwards and outwards on the inner side of the anterior testis, formed a loop around the dorsal portion of the ventral sucker (figs. 1, 4) and descended on the other side, passing gradually towards the median line until, just behind the sucker, it lay alongside its ascending branch. It then proceeded posteriorly to the level of the gonopore, turned sharply dorsally, became associated with the tissue of the undifferentiated cell mass, and joined the vas deferens immediately before the latter opened at the gonopore.

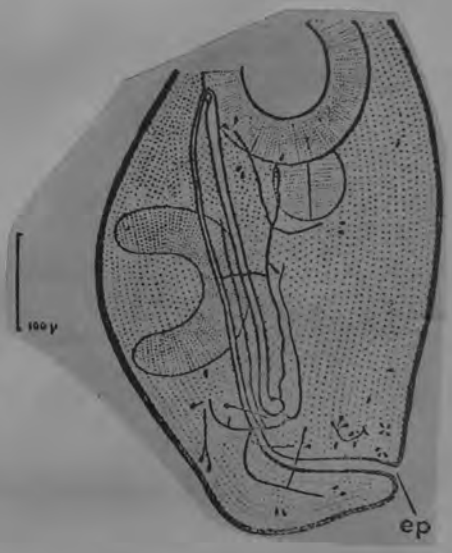
Excretory System

The excretory pore (fig. 5) was on the dorsal surface immediately above the genital opening, and led into a small rounded excretory bladder (fig. 7). The latter received Laurer's canal dorsally (figs. 4, 7, 20), while laterally it gave rise to two main collecting tubes (fig. 6) which passed upwards, external to the intestinal caeca, to well beyond the base of the anterior sucker. Here these canals bent backwards until they reached the level of the posterior region of the sucker, where they became dilated just before giving rise each to an anterior and a posterior collecting tubule.

The anterior tubule passed forwards and, in the region of the ventral sucker, gave rise to a dorsal branch and a short ventral branch which appeared to join the main ascending tube; the main stem then continued to the level of the pharynx, where it divided into three branches; one of these passed dorsally below the pharynx, while the second and third travelled forwards, one lateral and the other ventro-lateral to the pharynx.

The short posterior tubule almost immediately gave rise to several accessory branches. The first passed upwards alongside the anterior collecting tubule, the second between the ascending and descending main tubes; the third, fourth and fifth were terminal, the third proceeding anteriorly to end behind the ventral sucker, the median fourth lying between the other two and travelling backwardly towards but below the excretory bladder, and the fifth dorsally towards but above the bladder. The bladder and the proximal ends of the main excretory tubes were lined with cuticle.

The correct number and arrangement of the flame cells and excretory tubules could not be determined owing to the small number of cercariaea available for study, their thickness, and the small size of the flame cells. The figure and descriptions of this system, therefore, give only an approximation of their arrangement.



- Johnston & Cleland (1938)

Figs. 1-5

Fig. 1, cercariaeum, dorsal view; 2, cercariaeum in sheath; 3, sporocyst and pulsating sac; 4, cercariaeum, lateral view; 5, excretory system.
Figs. 1 and 4 drawn to scale beside fig. 1; figs. 2 and 3 to scale indicated beside each

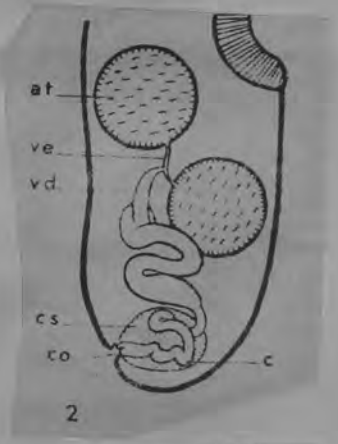
L. australiense Johnston & Cleland, 1938 (con't).

→ (material on this page from Johnston & Simpson, 1940) ←

Adults of *L. australiense* measured (under coverglass but without pressure) 2·25 to 2·4 mm. long by 1·15 to 1·4 mm. wide; the anterior sucker 0·55 mm. long by ·62 to ·66 mm. broad, and the ventral sucker ·60 to ·61 mm. long by ·55 mm. wide. The two suckers are thus subequal and about one-quarter the length of the worm. The ventral sucker is nearly central, but rather more of it lies in the posterior than in the anterior half of the parasite. The pharynx is nearly circular, measuring ·19 mm. long by ·2 mm. wide. The oesophagus is extremely short. The narrow, slightly wavy, caeca lie near the margins and terminate just behind the level of the posterior border of the posterior testis and near the hindmost limit of the uterine coils.

The testes and ovary are arranged as a triangle, the latter lying very close to, or touching, the posterior testis. The testes measure about ·46 by ·32 mm. The anterior is separated from the ventral sucker by the descending uterus, and from its fellow by the fecundarium and by some loops of the descending uterus. The vasa efferentia form an oblique straight line. The vas deferens is rather wide and thrown into several loops as it travels back to enter the rounded cirrus sac within which it lies twisted when at rest. The sac measures about ·2 mm. in diameter. The genital opening lies in a slight depression, somewhat dorsal, near the posterior extremity, the male duct terminating on a very slight prominence at its base. The male opening lies on the same side of the median line as the ovary; the female pore is on the other side of the depression. In one specimen the male apparatus is partly extruded, and if fully protruded the cirrus would probably measure about 0·125 mm.

The ovary is about ·32 mm. broad by ·23 mm. long. It touches the posterior testis and the fecundarium but is separated from the posterior sucker by loops of the ascending and descending uterus. The oviduct arises from the inner surface, travelling inwards, backwards and slightly dorsally to enter the fecundarium, in whose vicinity it joins the long Laurer canal. The anterior part of the latter is rather wider, forming a seminal receptacle, the remainder being narrow with a strongly chitinized wall. This canal passes back near the dorsal midline, above or near the posterior testis, to enter the dorsal aspect of the very small excretory bladder just as the latter receives its two longitudinal canals, these junctions lying just above or in front of the anterior part of the cirrus sac. The fertilizing duct travels in a coiled course through Mehlis' gland (fecundarium) which occupies a median position between the ovary and the two testes, coming into contact with the three organs. The uterus passes forwards between the ovary and anterior testes and may overlie parts of these glands. It then travels between the ovary and the posterior sucker and forwards, its coils occupying most of the zone between the latter and the crura, sometimes underlying the crura. It extends forwards as a massive structure, reaching at least the mid-level of the anterior sucker and then its folds cross between the pharynx and the posterior sucker below the crura to become strongly coiled on the other side of the worm, where it extends about as far forwards as on the opposite side. Just in front of the anterior testis it crosses to the opposite side, just behind the posterior sucker and below the ascending limb of the uterus. It forms a series of loops laterally from the ventral sucker, ovary and posterior testis, lying ventral to the level of the two latter organs, and then travels below the ovary across to the opposite side of the worm to occupy the region between the anterior testis and the cirrus sac. Its terminal portion lies beside the cirrus sac and opens beside the male pore. Sometimes uterine loops lie above the crura as well as below them, and also above some of the inner vitelline follicles.



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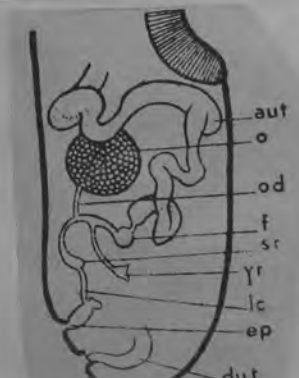

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The vitellaria form a long series of rather large, irregularly shaped, close-arranged follicles lying ventrally and ventro-laterally from the intestinal cru Posteriorly they extend almost to the end of the crura or they may reach the ex on one side only. Their limit lies at about the level of the hinder border of t posterior testis. In front they reach at least half-way along the oral sucke approximately to the same level as the foremost loops of the uterus, or they ma do so on one side, being shorter on the other. As in the case of the uterus, th extend considerably in front of the crura. Each transverse yolk duct passe inwards above the corresponding ascending excretory canal and below the cru then upwards to meet its fellow to form a yolk reservoir. One vitelline duct lie between the ovary and the posterior testis and the other behind the anterior testi The common yolk duct travels obliquely forwards to join the oviduct near th origin of Laurer's canal. Eggs measure 22 by 13·5-14 μ.

The excretory pore is dorsal, in front of the genital apertures, and lead downwards and forwards, very soon entering a small excretory bladder int which enter almost transversely the two main collecting canals. The bladder lie above the anterior part of the cirrus sac or just in front of it. The canals pa outwards, forwards, and slightly ventrally above the descending uterus and the below and close to the crura. They travel forwards ventro-laterally from th latter, but above and inwardly from the vitellaria. Each canal extends forward to the vicinity of the pharynx, then curving back to lie above and laterally fro the ascending canal. In the posterior region the latter, as well as the descendin canal lie almost directly ventrally from the corresponding crus. A delicate cana probably the anterior branch, lies above the corresponding crus.

Our species belongs to the same group as *L. holostomum*, as figured b Szidat in regard to the arrangement of the gonads, but in that species the uterin loops are limited anteriorly by the caeca. The uterine disposition i *L. australiense* resembles that in *L. macrostomum*, as illustrated by Szidat, who gave as synonyms of the latter, *L. insigne* Witenberg, 1925 *(nec* Looss), as well as *L. paradoxum* Carus of Zeller, 1874, and of Heckert, 1889, *L. insigne* (Looss) being quoted (along with *L. turanicum)* as a synonym of *L. holostomum*. If McIntosh's key (1932) be followed, our species would be placed beside *L. icteri* McInt., 1927, but the latter is a more elongate parasite, with its suckers smaller in relation to the length of the worm, and has much shorter vitellaria, a circular ovary, and gonads more remote from the ventral sucker. *L. australiense* differs from *L. actitis, L. variae* and *L. cyanocittae* mainly in regard to the posterior extension of the intestinal crura, vitellaria and uterine loops. McIntosh (1932. 39) referred to the similarity between *L. actitis* and *L. insigne* of Witenberg *(nec* Looss). *L. australiense* somewhat resembles *L. dasylophi* Tubangui (1928). but differs in regard to the distribution of the yolk glands and the forward extension of the uterine loops.

EXPLANATION OF FIGURES

Fig. 1, adult; 2, adult, male system, lateral view (figs. 2 and 3 constructed from series of longitudinal sections); 4, T.S. at level of genital apertures; 5, T.S. region of excretory pore; 6, T.S. at level of yolk reservoir; 7, T.S. showing yolk ducts; 8, T.S. across region of oviduct; 9, longitudinal section, nearly median; 10, cercariaeum; 11, sporosac; 12, T.S. pigmented band of sporosac.

References to Lettering—at, anterior testis; aut, ascending uterus; c, cirrus; cm, circular muscle; co, cirrus opening; cs, cirrus sac; db, dark brown band; dut, descending uterus; ep, excretory pore; f, fecundarium; g, green band; i, intestine; im, inner membrane; ic, Laurer's canal; o, ovary; od, oviduct; ou, opening of uterus; p, pigment; pc, pigment cells; pog, pale olive green band; rb, red brown band; sr, seminal receptacle; u, uterus; vd, vas deferens; ve, vas efferens; yd, yolk duct; yr, yolk reservoir.

Leucochloridium from Succinea australis

In a snail collected in May, 1938, at Elwomple, there were found two pulsating sacs, one in each antenna. In strong sunlight the pulsation and the coloured bands could be seen through the snail's tissues. One sac measured about 7·5 mm. long and 1·4 mm. broad. The banding was different from that occurring on sporocysts previously described by us. The coloured bands on the distal third of the sac consisted of an irregular ring of brown wart-like processes proximally, then two complete reddish-brown rings, a green band occupying the more distal part of the second brown ring; then two green bands; a bright reddish-brown band; and a narrow dark brown band; and a series of six brown warts arranged at the free extremity. The other sac was similar, except that there were fewer warts in the proximal row, the colouration of the second green band was irregular, and the dark brown ring was interrupted on one side to form wart-like processes. One sac was sectioned and the structure of a coloured band (fig. 12) was seen to be similar to that described by Monnig (1922). The cercariae (fig. 10) resembled those of *L. australiense* in all features. The anterior sac was ·2-·21 mm. long by ·19 mm. broad, and the posterior ·15-·17 mm. in diameter. Some of the worms were fed to a canary, but adult stages were not obtained.

Leucochloridium beauforti Hunter & Vernberg, 1952

LEUCOCHLORIDIUM BEAUFORTI, N. SP. (TREMATODA: BRACHYLAEMIDAE) FROM THE SEASIDE SPARROW, *AMMOSPIZA MARITIMA MACGILLIVRAII* (AUDUBON)

WANDA SANBORN HUNTER[1] AND WINONA B. VERNBERG
Duke University, Durham, North Carolina

1952
J.P. 38:215

During the summers of 1949–51, four of one hundred seaside sparrows, *Ammospiza maritima macgillivraii* (Audubon) examined at the Duke University Marine Laboratory were found to carry a new species of *Leucochloridium*. Each of these four immature male birds carried from 30 to 40 worms in the bursa and rectal regions.

Specific diagnosis: Leucochloridium beauforti n. sp. (Fig. 1). (Based on stained specimens, sections and whole mounts; all measurements in millimeters.) With the characters of the genus. *Leucochloridium beauforti* is a comparatively small worm ranging from 0.476–0.683 (av.: 0.598) in length. The width varies from 0.226–0.439 (av.: 0.333) in the region slightly anterior to the acetabulum. The shape is roughly ovoid; both ends are bluntly rounded, the posterior being narrower than the anterior. Cuticle may show fine spines, particularly at the anterior end. The subterminal oral sucker ranges in diameter from 0.208–0.267 (av.: 0.233). The postequatorial acetabulum varies from 0.176–0.257 (av.: 0.209). The slightly larger size of the oral sucker compared with the acetabulum is a constant character. No prepharynx. The pharynx measures from 0.050–0.099 (av.: 0.085) in length and from 0.093–0.119 (av.: 0.111) in width. No esophagus is present, the intestinal crura bifurcating immediately posterior to the pharynx. The crura bend sharply antero-lateral to reach beyond the anterior level of the pharynx. They then turn posteriorly and extend to the posterior level of the genital atrium. Gonads arranged in more or less of a triangle. The ovary, 0.064–0.099 (av.: 0.079) in diameter, is anterior to the right (posterior) testis, and is dorsal to the acetabulum. It varies in shape from round to ovoid. The vitelline glands, composed of small follicles, extend anteriorly to the middle level of the oral sucker. The posterior extent may be different on the two sides. Often they reach the middle of the testis on the left side and the anterior margin of the cirrus sac on the right side. The uterus is extracaecal, opening into the common genital atrium. Many shelled eggs present, measuring from 0.018–0.029 (av.: 0.024). The anterior (left) testis measures 0.060–0.082 (av.: 0.074), sometimes overlapping the acetabulum. The posterior (right) testis measures from 0.062–0.110 (av.: 0.082). The testes may be round or sub-globular in shape. The cirrus sac varies in shape from pyriform to round, measuring in length 0.097–0.153 (av.: 0.116), diameter 0.066–0.126 (av.: 0.088). One extended cirrus measured 0.059 by 0.113; it was non-spinous. The genital pore is supra-terminal.

Type: Deposited in U. S. Nat. Mus. Helm. Coll. (No. 37362).

Of the described species, *L. beauforti* most closely resembles *L. passeri* Wu, 1938 and *L. actitis* and *L. variae* McIntosh, 1932. It differs from all three species in its smaller size and sucker ratio. In *L. passeri*, the oral sucker is smaller than the acetabulum. In *L. actitis* and *L. variae*, the two suckers are almost equal in size, whereas in *L. beauforti*, the oral sucker is markedly and consistently larger than the acetabulum. The position of the gonads of *L. beauforti* is similar to that of *L. passeri*. In *L. actitis* and *L. variae*, there is no overlapping of the acetabulum by any gonad. The position of these glands is definitely posterior to the acetabulum in the two latter species.

Details of the "fecundarium" (as adopted by McIntosh, 1932 after Sinitsin, 1931) do not agree. There is a complex of ducts, namely: oviduct, common vitelline duct, and uterus, surrounded by glandular tissue, which lie between and slightly posterior to the two testes. Neither in sections nor in whole mounts could the details of this oötype region be worked out.

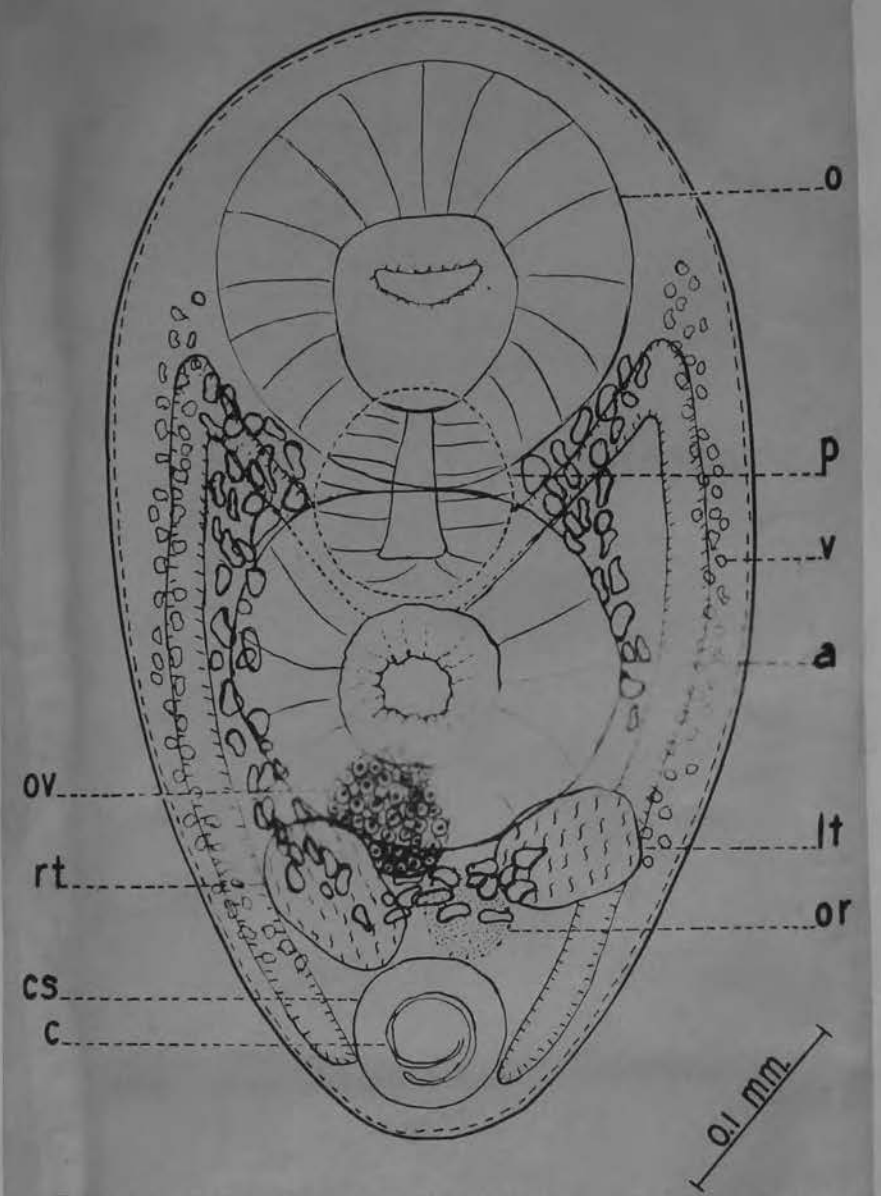

FIG. 1. *Leucochloridium beauforti* n. sp. enlarged from camera lucida drawing. a, acetabulum; c, cirrus; cs, cirrus sac; lt, left testis; o, oral sucker; or, oötype region; ov, ovary; p, pharynx; rt, right testis; v, vitellaria.

Host: *Ammospiza maritima macgillivrayi* (Audubon).
Location in host: Bursa of Fabricius and rectum.
Locality: Beaufort, N. C.

Leucochloridium ceylonicum Fernando, 1952

Fernando, E. F. W.
Leucochloridium ceylonicum sp. nov. proviz., a trematode from the Ceylon jungle fowl.
Ceylon J. Sci., Sec. B, Zool., 25 (1): 55-58

Leucochloridium costaricense n. sp. Brenes & Arroyo, 1962

La descripción de este tremátodo se realizó con dos ejemplares sexualmente maduros, fijados en líquido de Bouin y teñidos con carmín de Grenacher.

Tremátodos de forma elíptica aplastados en sentido dorsoventral, con cutícula lisa, que miden de 2,336 a 2,438 mm de largo por 1,033 mm de ancho.

La ventosa oral muy musculosa, en posición terminal, mide 0.399 a 0,413 mm de largo por 0,537 a 0,551 mm de ancho. La faringe es subesférica y mide 0,147 mm de largo por 0,152 mm de ancho. No observamos la prefaringe ni el esófago. Los ciegos se extienden hasta la extremidad posterior.

La ventosa ventral está situada en posición postecuatorial, sobre la línea media longitudinal y mide 0,444 a 0,482 mm de largo por 0,482 a 0,509 mm de ancho. La relación entre los diámetros de las dos ventosas es: 1 : 0,84 x 1 : 1,1 x 1 : 0,85 x 1 : 1,0.

Los testículos son ovales y situados oblicuamente formando un triángulo con el ovario en el cuarto posterior del parásito. El testículo anterior mide 0,147 a 0,179 mm de largo por 0,177 a 0,184 mm de ancho. El posterior mide de 0,138 a 0,140 mm de largo por 0,142 a 0,150 mm de ancho.

Ovario subglobular y situado casi en la misma zona del testículo anterior; mide de 0,129 a 0,147 mm de largo por 0,156 a 0,170 mm de ancho. Las glándulas vitelinas están constituídas por numerosos folículos que se extienden la-

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* Trabajo presentado en el II Congreso Latinoamericano y I Nacional de Microbiología, San José, diciembre de 1961.

** Departamento de Parasitología, Facultad de Microbiología, Universidad de Costa Rica.

teralmente desde una altura que corresponde a la porción distal de la faringe, hasta el borde superior del testículo anterior. Se observa el receptáculo vitelino. El útero está constituído por numerosas asas, que cubren casi en su totalidad el cuerpo del parásito y se extienden desde el borde inferior de la ventosa oral, hasta la extremidad posterior del parásito. Huevecillos operculados, miden de 0,025 mm de largo por 0,018 mm de ancho.

HUÉSPED: *Gymnostinops montezuma* (Lesson) Sclater ("oropéndola").

LOCALIZACIÓN: Intestino.

DISTRIBUCIÓN GEOGRÁFICA: Cachí, Provincia de Cartago.

EJEMPLARES: Holotipo y paratipo en la colección helmintológica del Departamento de Parasitología, Facultad de Microbiología, Universidad de Costa Rica, bajo el número 200-32.

DISCUSIÓN: Después de consultar los trabajos de TRAVASSOS (6), MCINTOSH (3) y YAMAGUTI (8), hemos llegado a la conclusión de que nuestros ejemplares constituyen una nueva especie: *Leucochloridium costaricense* basados en las siguientes características:

1. La extensión en la distribución de las glándulas vitelinas
2. Menor distancia entre el testículo posterior y la extremidad posterior que entre el anterior y el acetábulo.
3. Acetábulo en posición postecuatorial.
4. La distancia entre los campos de ambas ventosas, es casi dos veces el diámetro de la ventosa oral.
5. Genitales de menor tamaño.

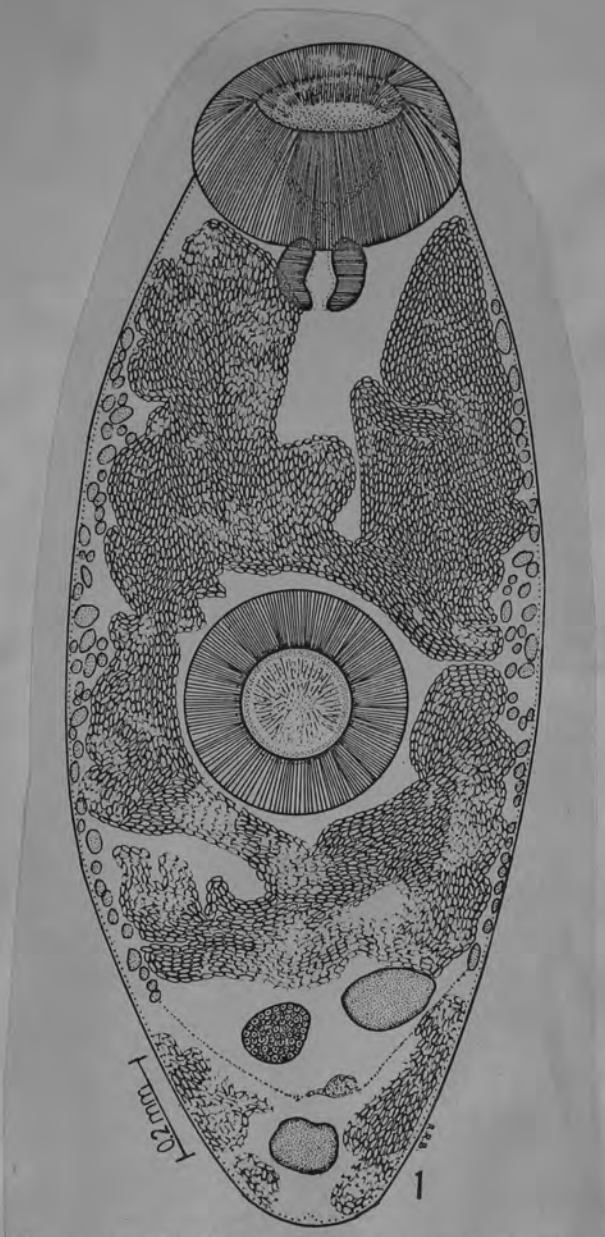


Fig. 1: *Leucochloridium costaricense*, n. sp. Preparación total; vista ventral.

Leucochloridium cyanocittae McIntosh, 1932

syn: **L. actitis** McIntosh, 1932

(see reverse & next page)

Leucochloridium cyanocittae n. sp. McIntosh, 1932

Fig. 1.

Specific diagnosis.—Body flat, ovate, 2.1 mm. long by 1.33 mm. wide in region between pharynx and acetabulum. Anterior sucker slightly subterminal, 360 μ by 630 μ. Pharynx 140 μ by 210 μ. Esophagus very short. Intestinal crura approximately uniform in diameter throughout entire length, left branch widest at posterior extremity; each branch extending into posterior end of body to area of cirrus pouch, the tips approximately 210 μ apart. Acetabulum somewhat smaller than oral sucker, 330 μ by 375 μ, situated near equator of body. Anterior testis with transverse diameter greater than longitudinal diameter, 130 μ by 200 μ; posterior testis 140 μ by 180 μ. Cirrus pouch about equal in size to posterior testis, 150 μ by 180 μ; cirrus 230 μ long, armed with spines. Genital pore at posterior end of body, median and terminal. Ovary 130 μ by 250 μ, situated anterior to posterior

testis and occupying the same field; each testis and the ovary occupying separate zones. Fecundarium[2] indistinct. Vitellaria extracecal, extending from zone of cirrus pouch to posterior half of anterior sucker. Uterus filled with eggs, occupying all of intercecal space except area of acetabulum and area of cirrus sac, extending into extracecal area lateral to anterior sucker. Eggs 24 μ by 18 μ.

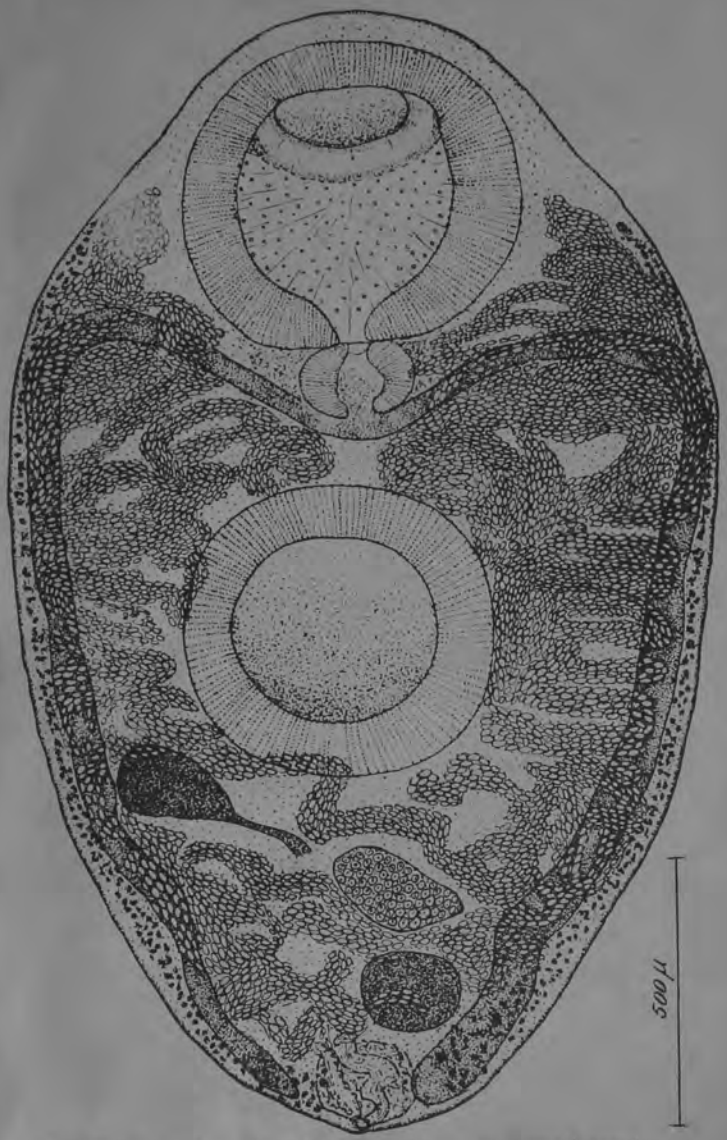
Type specimen.—U. S. Nat. Mus. Helm. Coll. No. 32307.

Host.—*Cyanocitta cristata bromia* (blue jay).

Location.—Cloaca.

Locality.—Michigan (Hook Point on Douglas Lake).

The above species has much in common with *L. actitis* n. sp. (p. 36) from the spotted sandpiper, *Actitis macularia*. In both species the vitellaria extend into the posterior part of the body, and the reproductive glands have the same general arrangement. Some of the outstanding differences between the two species are as follows: In *L. cyanocittae* the body, suckers, and pharynx are of greater size, and the anterior testis is well separated from the ovary, usually by a distance not less than the diameter of the testis; in *L. actitis* the ovary and anterior testis are closer together, and the pharynx is unusually small, the diameter being usually less than that of the ovary.



Text Figure 1.—*Leucochloridium cyanocittae* n. sp., ventral aspect.

FIG. 10. Adult *Leucochloridium cyanocittae* McIntosh, dorsal view, from Red Wing Blackbird (*Agelaius phoeniceus*).

FIGS. 21–24. Adults of *Leucochloridium cyanocittae* McIntosh from various experimental hosts.

FIG. 21. From a canary (*Serinus canaria*), five days after feeding, ventral view.

FIG. 22. From an English Sparrow (*Passer domesticus*), 10 days after feeding, ventral view.

FIG. 23. From a Marsh Wren (*Cistothorus palustris*), five days after feeding, dorsal view.

FIG. 24. From a Starling (*Sturnus vulgaris*), 10 days after feeding, dorsal view. Specimen from the feeding experiment conducted by McIntosh and McIntosh (1939).

FROM KAGAN, 1951

Leucochloridium actitis n. sp. McIntosh, 1932

Figs. 3 and 4.

— syn. of. L. cyanocittae

— see previous page

Specific diagnosis: Body flat, ovate, 1.72 mm. long by 960 μ wide in front of acetabulum. Oral sucker 400 μ by 400 μ, subterminal. Pharynx 100 μ by 150 μ. Esophagus very short. Intestinal crura extending posteriorly into zone of cirrus pouch, the tips approximately 70 μ apart. Acetabulum 370 μ by 400 μ, near center of body. Reproductive glands almost spherical; anterior testis 175 μ by 175 μ, located to left of median line of body and immediately posterior to acetabulum; posterior testis 170 μ by 150 μ, situated to right of median line and immediately in front of posterior extremity of right branch of intestinal crura. Cirrus pouch approximately spherical, measuring 120 μ in diameter in specimens with cirrus not extended; cirrus 300 μ long when protruded, armed with spines. Genital pore at posterior end of body, median and terminal. Ovary 160 μ by 170 μ, diagonally in front of posterior testis and adjacent to right branch of intestinal crura, occupying a part of the field of the posterior testis and a part of the zone of the anterior testis; zones of ovary and posterior testis contiguous. Fecundarium indistinct. Vitellaria extracecal, extending from posterior extremities of intestinal crura to zone of posterior fourth of anterior sucker. Uterus filled with eggs, occupying most of intercecal area [illegible] extending into antero-lateral extracecal area. Eggs 22.5 μ by 17 [illegible]

Type specim[illegible].—U. S. Nat. Mus. Helm. Coll. No. 32399.

Host.—Actitis macularia (spotted sandpiper).

Location.—Cloaca.

Locality.—Michigan (Cecil Bay near Douglas Lake).

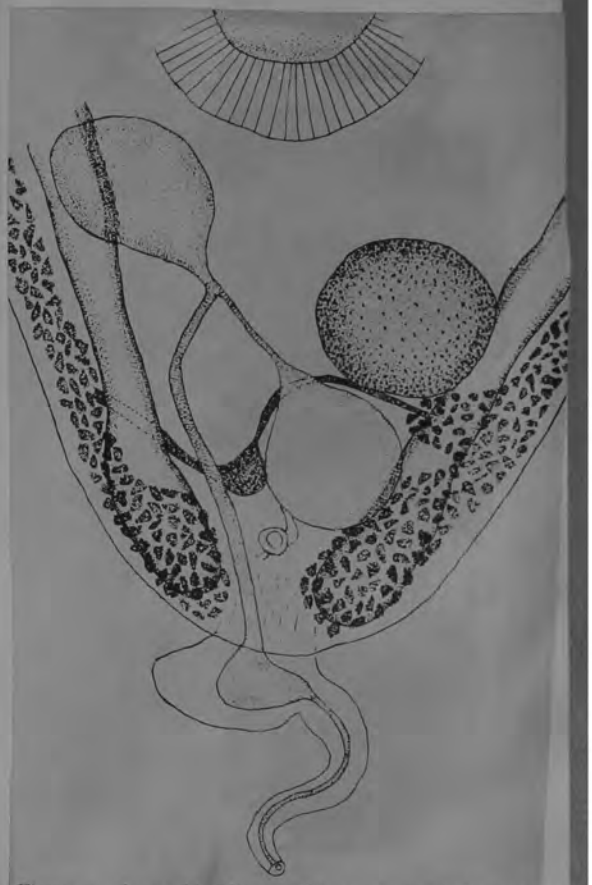
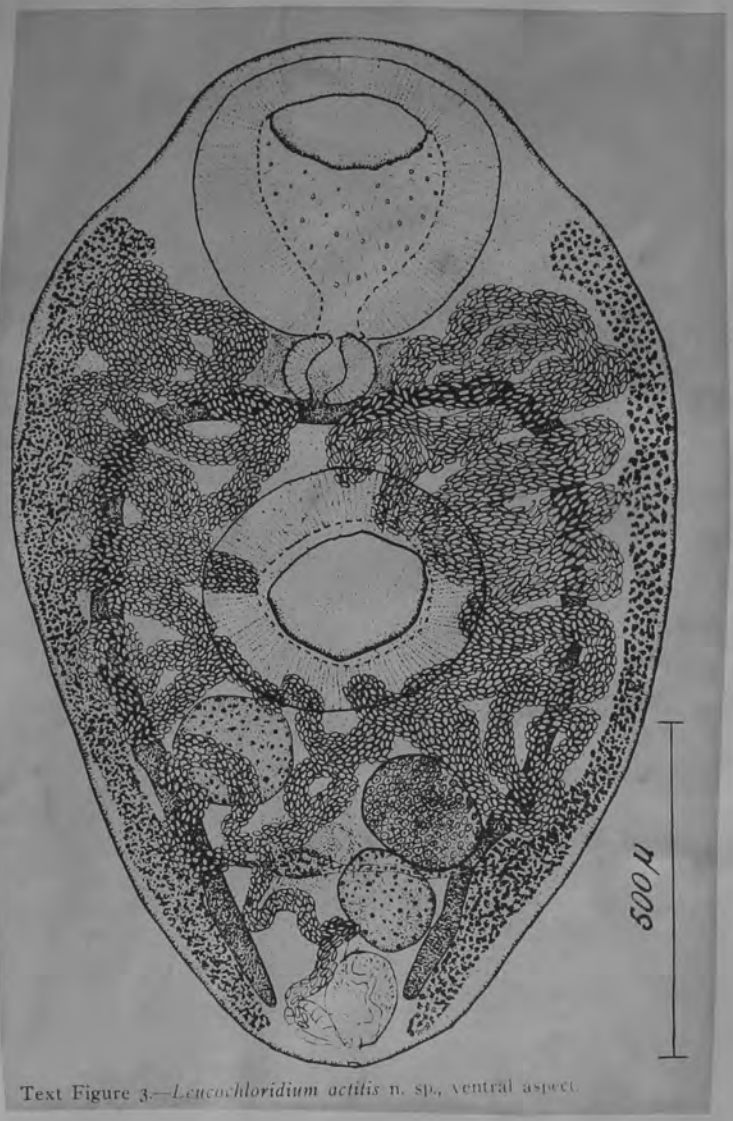


Figure 4.—*Leucochloridium actitis* n. sp., posterior extr[illegible] male reproductive system.

In some specimens of the above species the position of the reproductive glands was observed to be reversed; that is, the anterior testis occurs on the right instead of the left side of the body, with the ovary and posterior testis on the opposite side. Individuals of this species reach sexual maturity earl[illegible]and before attaining maximum size. Specimens as small as 1 m[illegible]g, taken from juvenile birds, contained numerous eggs. This spe[illegible]s pointed out above, has many points in common with *L. cyanocit[illegible]* In comparing the two species it is well to bear in mind that *L. ac[illegible]* has a comparatively small pharynx, the diameter of which seldom exceeds that of the ovary, while in *L. cyanocittae* the pharynx is usually larger than the ovary.

Witenberg (1925) described and figured a fluke from a closely related host, *Actitis hypoleuca*, under the name *L. insigne* (Looss), which, in the opinion of the writer, is not *L. insigne* (Looss), but is a species closely related to, if not identical with, the form described here as *L. actitis*. A comparison of Witenberg's figures 10–13 with figures 3 and 4 of this paper shows the similarity of these two forms from related hosts. The writer separates *L. actitis* from *L. insigne* (Looss) largely on the basis of the vitellaria which extend into the area lateral to the oral sucker in *L. actitis*, while in *L. insigne* (Looss) the vitellaria end at the level of the pharynx. *L. insigne* (Looss) is also much larger, and was taken from an unrelated host, the European coot, *Fulica atra*.



Text Figure 3.—*Leucochloridium actitis* n. sp., ventral aspect.

DESCRIPTION OF THE SPOROCYST

The mature branches or brood sacs of the sporocyst grow out from a central portion embedded in the liver of the snail and visible only on dissection. At different times, the distal ends of one, two or all three of the brood sacs could be seen clearly through the transparent tissues of the tentacles and anterior end of the snail. The branches were extensile and retractile and capable of entirely disappearing into the snail's body. At least one was always visible; often one could be seen in each tentacle. Although this was the preferred location, when three brood sacs were visible the third was in the center, over the radula, and sometimes turned back on itself. The visible portions of all three branches were plump, the tentacles containing them were greatly distended, and the snail could not retract into the shell normally. By strong, transmitted light about 100 metacercariae could be seen in each brood sac. They were floating free of each other and of the sporocyst wall, and were tumbled about violently by the movements of the brood sac.

In the light, the brood sacs pulsated regularly, about forty to eighty times per minute. The rate was somewhat correlated with the light intensity, since it was noticeably more rapid in direct sunlight than in a normally-lighted room. To what extent temperature was a factor was not determined. The pulsation was a combination of movements resembling peristalsis, which resulted in alternate shortening and lengthening, giving the appearance that the distal end of the brood sac was pounding violently against the snail's tissue. Lutz (1921) showed a photograph of brood sacs lying free of the snail; Wesenberg-Lund (1931) and Woodhead (1935) saw brood sacs escape after rupturing the snail's tissues by these movements, possibly with some help from the snail. In absolute darkness the brood sacs were motionless; in from two to five minutes after exposure to bright light they were again completely active.

The colors and pattern (Fig. 1) of the brood sacs were so plainly visible that they were photographed *in situ* in Kodachrome. The distal end of each was capped with dark brown and chestnut brown pigment, followed in order by bands of: narrow white; wide chestnut brown; narrow white; wide chestnut brown; narrow white; wide, pale tan; narrow white; wide, pale tan; narrow white; wide chestnut brown; narrow white; wide chestnut brown; narrow white; wide chestnut brown; wide, pale tan; narrow white; narrow, pale tan. The proximal half of the plump part of the brood sac was white. This pattern was complicated by four things: each band was of varying width, as the edges were not parallel; some of the bands were incomplete; one edge of one chestnut brown band was a darker brown; and the movement caused a variable change in width of all the bands. However, the basic pattern was the same in all three brood sacs: two sets of brown and white bands alternated with two sets of pale tan and white bands. No knobs or grooves, such as have been described on other sporocysts, were noted.

Preparatory to the infection experiments the sporocyst was partly dissected from the snail in tap water, and one brood sac cut off. The pulsations of this branch were undiminished, and resembled the crawling movements of an earthworm, although no progress resulted. The proximal one-third was attenuated, and had been attached to an irregular central mass of undetermined size, to which the other brood sacs were also attached. The overall length was about 1.5 cm and the width about 4 mm; the movement precluded accurate measurement.

FIG. 1. Two brood sacs in the tentacles of *S. ovalis*, dorsal view, one shown in detail. Traced from a projection of a 35mm Kodachrome slide; most proximal tan and white bands only approximated. CB, chestnut brown; DB, dark brown; LB, light brown; TA, tan; white not labelled.

Leucochloridium fuscostriatum Robinson, 1948

syn: Leucochloridium sp. (Rensselaerville sporocyst) of Ingram & Hewitt, 1942

-see also next page

Robinson (1948)

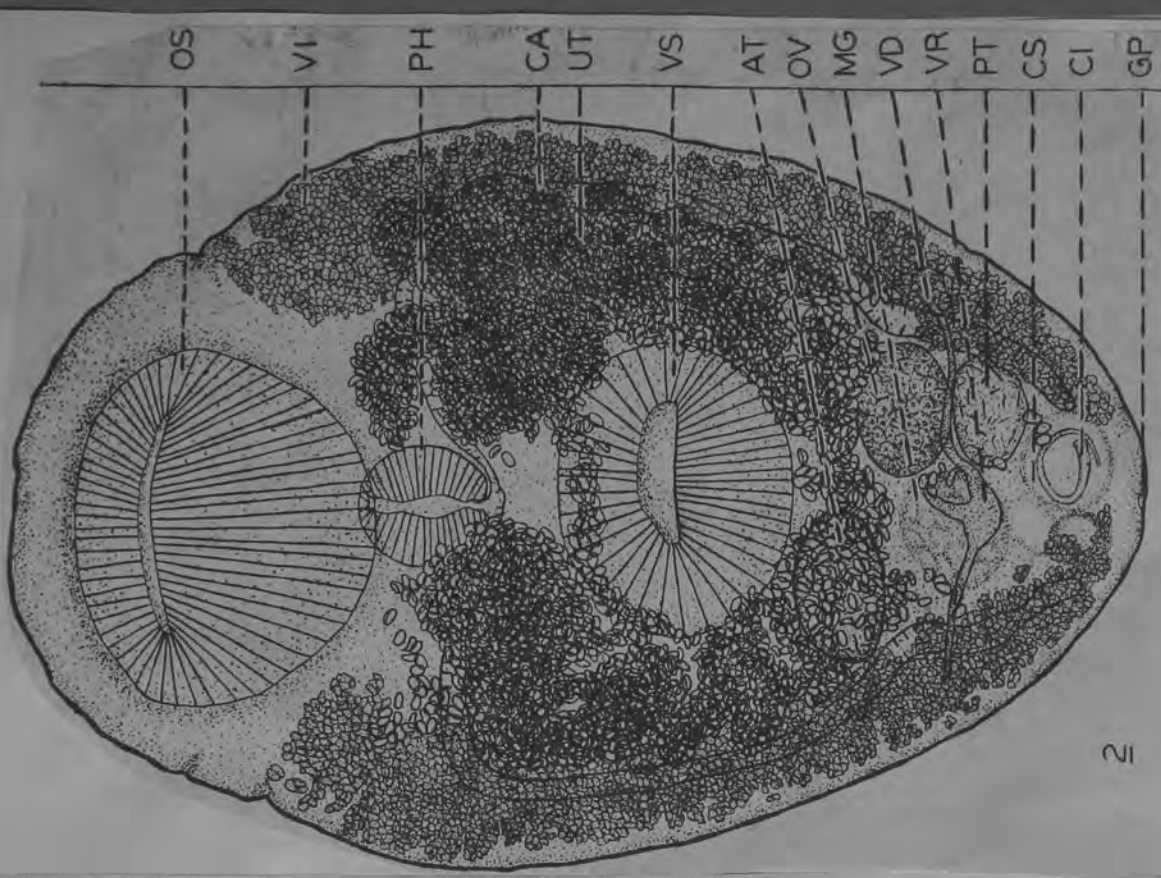


FIG. 2. Adult *Leucochloridium fusostriatum*, twelve days old, ventral view. Traced from a projection. AT, anterior testis; CA, cecum; CI, cirrus; CS, cirrus sac; GP, genital pore; MG, Mehlis' gland; OS, oral sucker; OV, ovary; PH, pharynx; PT, posterior testis; UT, uterus; VD, vitelline duct; VI, vitellaria; VR, vitelline reservoir; VS, ventral sucker.

When fixed, whether under pressure or not, the maximum breadth (Fig. 2) is at the level of the pharynx. The cuticula is smooth. The oral sucker is subterminal, there is no prepharynx or esophagus, the pharynx is muscular, and the ceca are simple and extend almost to the genital pore. Most of the ventral sucker is post-equatorial, and it is about four-fifths the size of the oral sucker. The genital pore is posterior, median and terminal.

The gonads are arranged in a triangle, the anterior testis close to or touching the right posterior corner of the ventral sucker. The ovary and posterior testis are just to the left of or touching the midline. The zones of the anterior testis and ovary are contiguous or somewhat overlapping; those of the posterior testis and ovary are contiguous, and their fields coincide. All three gonads are smooth, and wider than long. The anterior testis is somewhat larger than the posterior; the ovary and anterior testis are subequal in size.

The numerous vitelline follicles lie exclusively in the ventral half of the worm. Laterally, they are extra-cecal; medially, their maximum extent is to a point half-way between the lateral edge and mid-ventral line; longitudinally, they extend from the level of the center of the oral sucker, posteriorly almost to the genital pore. The left vitelline duct passes between the posterior testis and the ovary, and the right one lies in a corresponding position. The vitelline reservoir is prominent, and is situated to the right of the midline.

The uterus lies on both sides of the ventral sucker in two distinct masses, although loops may cross the midline anterior or dorsal to the sucker. No part of the uterus is lateral to the ceca, but anteriorly on each side one loop extends to the level of the anterior end of the pharynx. The numerous eggs obscure the anterior testis; posterior to that organ there is only one uterine loop, leading to the genital pore, so the ovary and the posterior testis are not hidden. The cirrus sac is partly to the left of the midline, and contains a long, coiled cirrus.

acid hematoxylin and the other with Mayer's paracarmine. Since so few worms were studied, all measurements are given in Table 1.

TABLE 1

	Whole mount, paracarmine	Whole mount, hematoxylin	Frontal section	Transverse section
Length	*mm* 1.33	*mm* 1.14	*mm* 0.75	*mm* 0.70
Width, maximum	0.87	0.73	0.42*	0.70
Thickness	.....	...	.....	0.27
	microns	*microns*	*microns*	*microns*
Oral sucker, length	383	350	315	250
Oral sucker, width	411	410	272*	360
Acetabulum, length	255	255	275	250
Acetabulum, width	267	267	290	315
Pharynx, length	147	150	91	88
Pharynx, width	133	121	121	140
Pharynx, thickness	.....	...	.....	90
Ovary, length	151	57	85	80
Ovary, width	157	171	115	109
Ovary, thickness	.....	...	.....	127
Ant. testis, length	175	obscured	61	64
Ant. testis, width	.....	...	115	109
Ant. testis, thickness	.....	...	.....	121
Post. testis, length	91	91	61	56
Post. testis, width	139	136	79	109
Post. testis, thickness	.....	...	.....	127
Cirrus sac, width	116	.....	.....	.....

* Some of the larger frontal sections were folded, so these measurements probably are not of the maximum width.

-all Robinson (1948)

Leucochloridium fuscostriatum Robinson, 1948
(continued--see previous page)
syn: Leucochloridium sp. (Rensselaerville sporocyst)of Ingram & Hewitt, 1942

THE RENSSELAERVILLE SPOROCYST

In the single specimen of *Succinea ovalis* collected at Rensselaerville, Albany County, New York, three well developed sporocyst branches were found. One was situated in each tentacle, and a third between them in the haemocoel. These branches were removed from the snail, the colors were noted, then they were preserved in three percent formaldehyde and measured. The left branch was 19 mm. by 4 mm., the right branch 17 mm. by 3 mm., and the middle branch 15 mm. by 3 mm. All three were banded very similarly with brown and white. The right and center branches each had sixteen bands of color, while the left branch had eleven. In the table below, which lists the color bands in order beginning at the distal ends, one can see that the three branches were similar in appearance.

Color Bands of the Rensselaerville Sporocyst Branches

Right Branch	*Center Branch*	*Left Branch*
red-brown	red-brown	red-brown
white	white	white
brown	brown	brown
white	white	dark brown, narrow
brown	brown	white
dark brown, narrow	white	light brown
light brown	brown	white
white	dark brown, narrow	brown
light brown	light brown	white
white	white	brown
light brown	light brown	dark brown, broken
white	white	
[illegible]	light brown	
white	white	
[illegible] brown	light brown	
[illegible] brown, broken	dark brown, broken	

Below the dark brown, broken line, the proximal portion of the center branches had numerous incomplete transverse brown

The left and center branches were opened, and the metacercariae contained in them were counted. In the left branch were 160 metacercariae, and in the middle branch were 100 metacercariae.

Leucochloridium ghanensis ~~sp. n.~~ (Figs. 1, 2). Fischthal and Thomas, 1972

Host: *Picathartes gymnocephalus* (TEMMINCK), bare-headed rock fowl (Picathartidae).

Habitats: Liver, gall bladder, small intestine.

Locality: Ashanti region, Ghana.

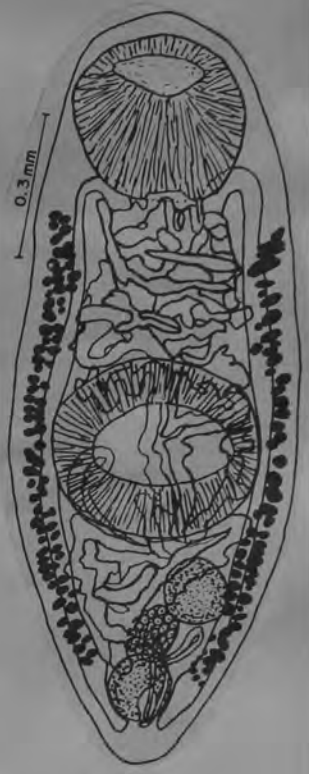
Dates: 4, 5 November 1957.

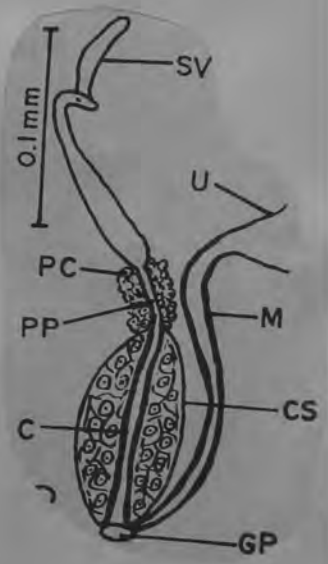
Specimens deposited: USNM Helm. Coll. N° 71.804 (holotype and paratypes); N° 71.805 (paratypes). — MRAC Tervuren, Helm. Coll. 34.885 (paratypes).

Description (based on 25 adult worms, 10 measured): Body elongate, relatively narrow, widest at acetabular level when relaxed and at pharyngeal level when contracted, tegument entirely spined. 1,450-2,035 long by 510-735 wide. Forebody 670-955 long, narrowing only slightly from acetabulum to broadly rounded anterior extremity; hindbody 415-635 long, narrowing quickly to rounded point at posterior extremity; forebody-hindbody length ratio 1 : 0.53-0.77. Oral sucker subterminal ventral, round to longitudinally or transversely elongate, 355-420 by 325-425; preoral space 3-46 long; acetabulum postequatorial, round to longitudinally or transversely elongate, filling intercaecal space at its level, may overlap caeca ventrally, 355-545 by 395-500; sucker length ratio 1 : 0.99-1.36, width ratio 1 : 1.00-1.27. Prepharynx very short, not always visible; pharynx usually contiguous with oral sucker, usually wider than long, 145-195 by 145-220; oesophagus very short, bifurcating almost immediately; caeca narrow, outer wall composed of cuboidal cells lying on basement membrane, lined internally with columnar cells, ascending sides of pharynx before looping posteriorly, sometimes ascending sides of oral sucker (up to posterior one third), usually extending posttesticular but may terminate at level of posterior margin of posterior testis; postcaecal space 56-82 long.

Gonads postacetabular, smooth, round to longitudinally or transversely elongate; both testes, either one, or neither may be contiguous with or overlap ovary. Anterior testis sinistral, close to acetabulum, 102-182 by 109-157; posterior testis median, more or less embraced by caecal ends, 107-191 by 92-177; posttesticular space 63-120 long. Vas efferens emerging from posterior margin of anterior testis and from anterior margin of posterior testis; vas deferens very short; seminal vesicle relatively long, sinuous, tubular, passing posteriorly ventral to ovary to anterior margin or anteroventral part of posterior testis; pars prostatica straight, narrower and much shorter than seminal vesicle, surrounded by prostate cells; cirrus sac thin walled, longitudinally oval, 63-105 by 30-80, containing muscular, unspined, straight to slightly sinuous cirrus. Genital atrium shallow, small. Genital pore ventral, median to slightly submedian, 58-106 from posterior extremity, location varying from posterior third of posterior testis to short distance posttesticular.

Ovary median to submedian (right), more or less intertesticular, smaller than testes, 78-134 by 74-134. Oviduct emerging from sinistrolateral margin of ovary. Mehlis' gland dorsosinistral to ovary. Vitellaria in lateral fields, extending from pharyngeal to ovarian or anterior part of posterior testis level, posterior extent lying 163-250 from posterior extremity, well anterior to caecal ends, follicles mainly extracaecal but pre- and postacetabularly overlapping caeca ventrally only, may rarely overlap caeca dorsally in same areas along the fields and ventrally opposite acetabulum; transverse vitelline ducts emerging from near posterior end of each vitellarian field, uniting to form relatively large vitelline reservoir usually lying ante-





rosinistral to but sometimes contiguous with posterior testis. Uterus with single ascending and descending limbs which pass dorsal to middle half of width of acetabulum, ascending on right (rarely on left) with much coiling between ovary and posterior third of acetabulum and between anterior third of latter and pharynx or oral sucker, without anterolateral uterine loops extending precaecally, transverse coils overlapping pharynx ventrally, may overlap posterior part of oral sucker ventrally, descending limb likewise extensively coiled on side opposite ascending coils, postacetabular coils lying anterior and dextral to anterior testis, in descent passing ventral to ovary to its sinistral side; metraterm thick walled, muscular, straight to slightly sinuous, longer than cirrus sac, lying sinistral or ventral to latter, opening into genital atrium. Eggs numerous, yellow near ovary, becoming increasingly darker and brown as they progress through uterus, operculate, 41 measuring 21-31 (25) by 12-16 (14).

Excretory bladder thick walled, tubular, short, posttesticular; primary tubules paralleling caeca; pore subterminal dorsal.

DISCUSSION: The genus *Leucochloridium* CARUS, 1835, is a large one with many avian and mammalian representatives. The only reported African species is *L. insigne* (LOOSS, 1899) MAGATH, 1920, from the avian host *Fulica atra* L. (Rallidae) from Egypt. Our collection consists of one worm from the host's small intestine collected 4 November and 24 from its liver and gall bladder collected the next day. In having the uterus ascending to a preacetabular level and passing over to the other side of the body between the acetabulum and pharynx before descending our new species differs from all those that can be included in KAGAN's (1952) concept of the genus *Urogonimus* MONTICELLI, 1888 (syn. of *Leucochloridium*). In having a nonpustulated cirrus and uterine coils extending anterior to the caecal bifurcation our form differs from all those that can be included in KAGAN's new genus *Neoleucochloridium* (syn. of *Leucochloridium*). Our form differs from KAGAN's concept of *Leucochloridium* in that there are no precaecal uterine loops along the sides of the oral sucker. *L. hypotaenidiarum* TUBANGUI, 1932 (Philippines), *L. japonicum* ISHII, 1932 (Japan), *L. perisorisae* NEILAND, 1953 and ARROYO, 1962 (Costa Rica) resemble our species in having the (U.S.), *L. nainitalensis* BAUGH, 1962 (India), and *L. costaricense* BRENES vitellaria terminating anterior to the caecal ends. *L. hypotaenidiarum* differs in the preequatorial position of the acetabulum which does not fill the intercaecal space, the posterior testis being far anterior to the caecal ends, the cirrus sac lying posttesticular, and the vitellaria extending posttesticular. *L. japonicum* differs in having a very long forebody, the gonads triangularly arranged, and the cirrus sac and some uterine coils posttesticular. *L. perisorisae* differs in having lateral precaecal uterine loops, the gonads triangularly arranged, the cirrus sac opposite the posterior testis, and only the anterior end of the body spined. *L. nainitalensis* differs in having the acetabulum equatorial and not filling the intercaecal space, the vitellaria commencing postpharyngeally, the cirrus sac posttesticular, the uterus entirely intercaecal, and the ovary as large as or larger than the anterior testis. *L. costaricense* differs in the more anterior position of the acetabulum which does not fill the intercaecal space, and the uterus having lateral precaecal loops as well as extending to the posterior end of the body; no mention is made of the cirrus sac nor is it illustrated. Our species also resembles *L. holostomum* (RUDOLPHI, 1819) LUTZ, 1928 (British Isles, Europe, Siberia), the latter differing in the oral sucker being larger than the acetabulum, the vitellaria extending to the caecal ends or beyond, the uterus having lateral precaecal loops, and the cirrus sac being posttesticular; *L. insigne* and *L. turanicum* (SOLOVJEV, 1912) are considered by some investigators to be synonyms of *L. holostomum*.

Leucochloridium heckerti Kagan, 1950

syns: Distoma macrostomum of Heckert, 1899
L. insigne of Witenberg, 1925
L. sp. Hsü from Vanellus vanellus

from Witenberg, 1926

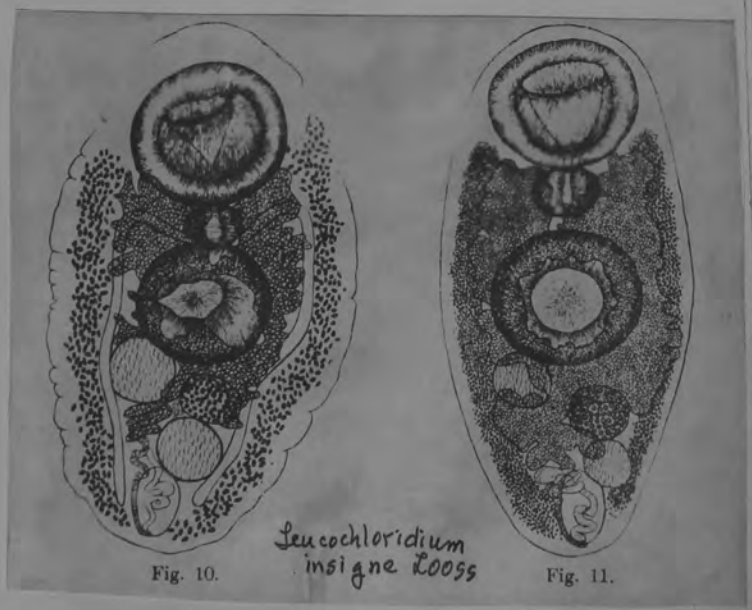


Fig. 10.

Leucochloridium insigne Looss

Fig. 11.

log. Jahrbücher Bd. 51. Abt. f. Syst.

Fig. 12.

L. insigne

L. insigne

Fig. 13.

Leucochloridium holostomum (Rud.,1819)

Syn.: L.turanicum Solovjev,1912)

from Witenberg, 1926

—see Urogonimus turanicus

Fig. 15.

Leucochloridium indicum Singh, 1962

– see *Urogonimus indicus*

– I have transfered this species to *Urogonimus* on the bases of uterine pattern and cirrus shape (blunt, as wide as long).

–P.D. Lewis May 73

Leucochloridium melospizae McIntosh, 1932

Leucochloridium melospizae n. sp. McIntosh, 1932

Fig. 5.

Specific diagnosis: Body flat, ovate, 1.41 mm. long by 920 μ wide. Oral sucker 400 μ by 500 μ, subterminal. Pharynx 120 μ by 175 μ. Esophagus very short. Intestinal crura end somewhat posterior to zone of posterior testis, and 200 μ from posterior end of body, the tips 170 μ apart. Acetabulum circular, 420 μ in diameter, located about at center of body and immediately posterior to pharynx. Reproductive glands comparatively small; anterior testis 70 μ by 80 μ, adjacent to right branch of intestine, and slightly posterior to zone marking posterior level of acetabulum; posterior testis more or less spherical, slightly larger than anterior testis, 100 μ in diameter, located anterior and median to posterior extremity of left branch of intestine. Cirrus pouch 100 μ by 120 μ; a well developed seminal vesicle present, 90 μ in diameter; cirrus, when protruded, about 120 μ long. Genital pore at posterior end of body, slightly subterminal. Ovary 80 μ by 100 μ, immediately anterior to posterior testis, occupying zone of anterior testis and field of posterior testis. Fecundarium prominent, about size of anterior testis, located between the testes and in line with them, and opposite the interval of ovary and posterior testis. Vitellaria extracecal, beginning anteriorly at level of posterior third of oral sucker and terminating posteriorly opposite the level of tips of intestinal crura. Uterus with numerous eggs, confined mostly to intercecal space, but a

few convolutions extend over ventral surface of intestine both laterally and anteriorly. Eggs 22 μ by 17 μ.

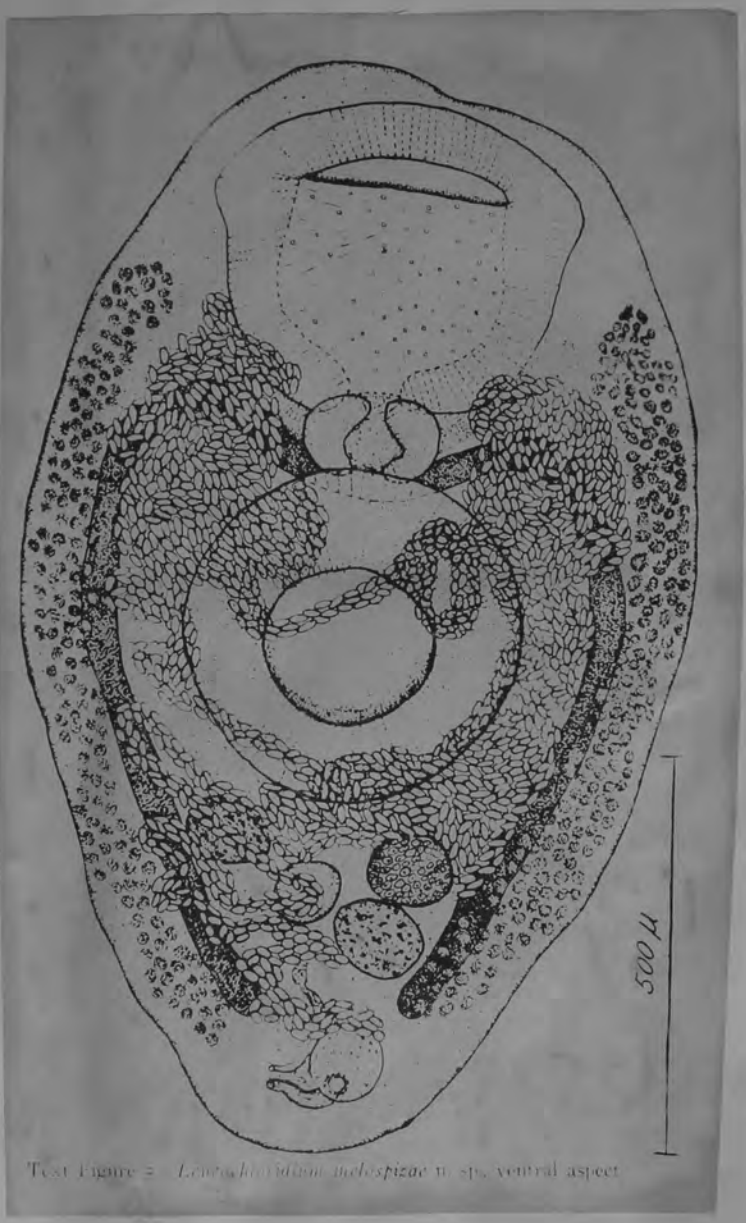
Type specimen—U. S. Nat. Mus. Helm. Coll. No. 32400.

Host.—*Melospiza melodia beata* (song sparrow).

Location.—Cloaca.

Locality.—Michigan (Monro Lake near Douglas Lake).

The above species resembles more closely *L. macrostomum* as figured by Zeller (1874) than any of the American species of the genus thus far described. In both species the vitellaria and intestinal crura end at the same level and at some distance before reaching the posterior end of the body. One of the outstanding differences is the small size of the reproductive glands in *L. melospizae*, the diameters of which are scarcely more than one-half that of the pharynx. The arrangement of the sex glands, including the fecundarium, in *L. melospizae* is also similar to the arrangement in *L. variae*, but the two species may be separated by the extension of the intestinal crura and the vitellaria, which in *L. variae* end in the zone of the cirrus pouch.



Text Figure 2 — *Leucochloridium inchespizae* n. sp., ventral aspect

Leucochloridium migranum n. sp.

Mother Sporocyst. The sporocyst is roughly club-shaped, being broadly rounded anteriorly and tapering posteriorly to an elongated, filamentous process.

The swollen portion of the club gradually increases anteriorly from a point 3.27 mm. from the posterior tip to attain a maximum width of 2.20 mm. near the middle of the forward part. Thus the filamentous portion is 3.27 mm. long by a maximum width of 500 μ. It is highly irregular in outline and is often coiled or greatly twisted. At the tip there is a slight enlargement. The forward part, the club, has a length of 12.20 mm. of which 6.6 mm. is a uniform pinkish-white color and is continuous with the filamentous part. The remainder of the clubbed part is highly colored. These colors can be described best from anterior to posterior. At the most anterior tip of the sporocyst there is a short band, about 600 μ long, of deep rust-brown in which is dispersed a number of irregularly placed dark-brown or chocolate-colored spots. This area is rather abruptly terminated by a wider band, about 1 mm. in length, of brownish-yellow. The brownish-yellow band is followed by a band, about 1 mm. in length, of brownish-green. The line of demarcation between the brownish-yellow band and the brownish-green bands is not nearly so well defined as is the case between the rust-brown and brownish-yellow bands. The brownish-green band becomes fused into a band, about 500 μ long, of deep olive-green which terminates abruptly. This is followed by a narrow band, about 300 μ long, of greenish-yellow. The greenish-yellow band is rather sharply set off from a yellow band that is about 700 μ in length. This is followed by a deep reddish-brown band that extends posteriorly for a distance of 2 mm. and terminates the colored portion of the sporocyst.

There are a series of wart-like structures on the surface of the anterior end of the club. These warty projections are rather low, knob-like bumps and are present for a distance of about 1.7 mm. from the tip. They are irregular of surface and are of a coffee-brown color. The area of the sporocyst covered by the greenish-yellow and yellow bands appear to be slightly constricted off from the remainder of the body so that there is a decided diminution in the width at this level. As indicated in the figure (Fig. 1) there are about 6 or 7 narrow longitudinal bands of white which cross most of the greenish-yellow band and all of the yellowish band. The greatest width of the sporocyst is attained in the region of the reddish-brown band and here again we find about 8 or 9 white longitudinal bands or stripes extending from the point of demarcation between the yellowish band and the reddish band to near the termination of that band. In certain cases the longitudinal bands of these two areas appear to be continuous, which in fact they may be, but due to the pronounced constriction at this point this fact could not be determined. In certain other cases, as is shown in the figure, these longitudinal bands do not coincide, and their point of termination could be determined readily.

Although no attempt was made to determine the total number of metacerariae contained within the sporocyst, the sporocyst was ruptured in manipulation and about 30 specimens of metacercariae were immediately released. The sporocyst was then preserved in 6 per cent formalin, which, unfortunately, has removed practically all trace of pigmentation. The metacercariae were studied both while alive and after being stained and mounted.

The Metacercaria. The metacercaria is incased within a transparent, jelly-like capsule that shows a decided brownish hue. On fixation the jelly-like substance becomes congealed into very fine rod-like spicules that tend to cluster into a more or less stellate pattern. During life no notice was taken of the fact that the jelly-like substance was dissolved in water or saline, although it was quite evident that the contained metacercaria was continuously tugging at this enveloping substance. Due to the fact that the intestine of the metacercaria was filled with an emulsified food material, and due to the fact that the metacercaria could be seen taking portions of the jelly into its mouth and tugging away at it in a characteristic feeding manner, the writer has concluded that the jelly-like

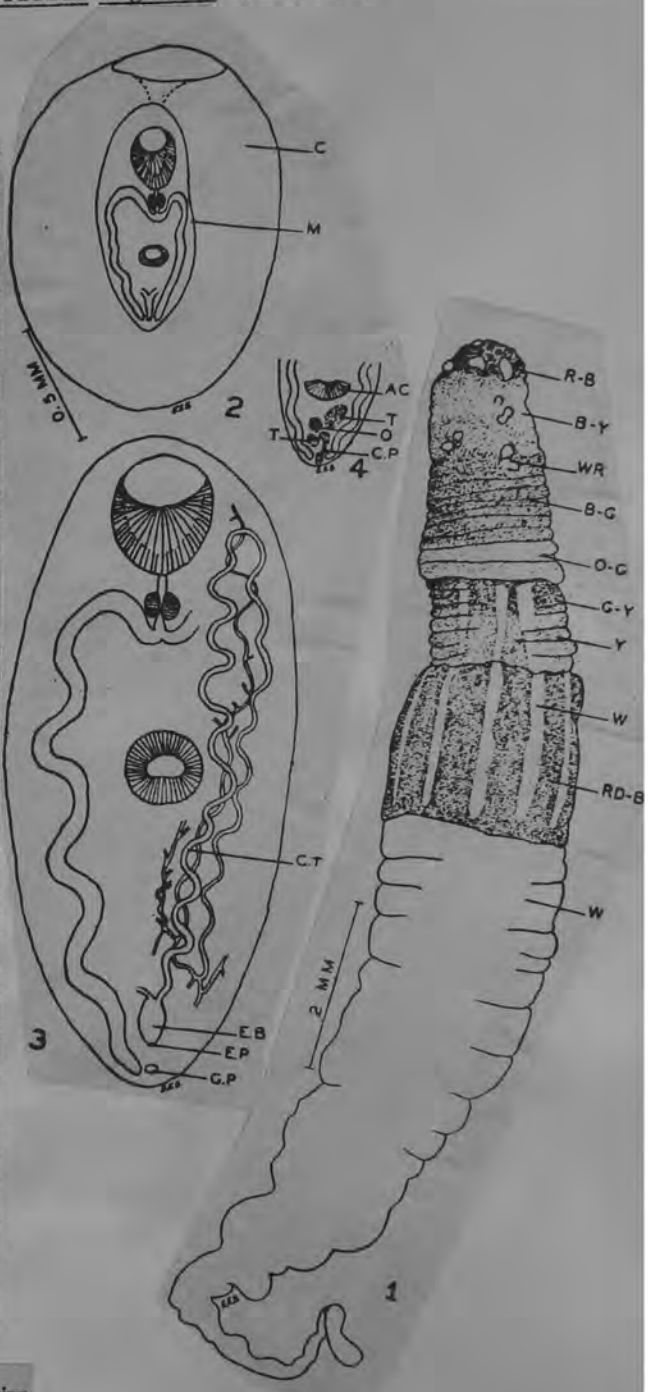


Fig. 1. Mature mother sporocyst of *Leucochloridium migranum* n. sp.

Fig. 2. Encysted metacercaria of *Leucochloridium migranum* n. sp., showing how the jelly-like cyst membrane may be pulled into the oral sucker of the metacercaria.

Fig. 3. Diagrammatic view of excysted metacercaria of *Leucochloridium migranum* n. sp., showing partial details of the excretory tubules.

Fig. 4. Posterior portion of excysted metacercaria of *Leucochloridium migranum* n. sp., showing the relative positions of the developing gonads. Drawn to the same scale as Fig. 2.

substance may serve a dual function, a medium for encystment and a source of food during its resting period. The fact that the metacercaria was actually taking the jelly into its mouth and pulling on the material is demonstrated by the decided indentation in the capsule at the oral end of the enclosed larva. This indentation appears and disappears in accordance with the activity of the metacercaria.

Measurements* of the jelly-like capsule and metacercaria are as follows:

Capsule		Metacercaria	
Length	Width	Length	Width
1.19	0.99	0.74	0.36
1.60	1.19	0.85	0.40
1.32	1.00	0.80	0.42
1.53	1.20	0.76	0.39
1.60	1.17	0.80	0.41
1.60	1.17	0.79	0.40
0.95	0.70	0.65	0.34

*Measurements are given in terms of millimeters.

The metacercaria is freed from the jelly-like mass with considerable difficulty since it appears to be flaky. Once freed the metacercaria becomes quite active, elongating and contracting in a typical trematode manner. The internal organs are not advanced to a stage that they are easily recognized in the unstained specimen. The two large suckers, the digestive tract, and the main tubules of the excretory system are the most prominent features of the living worm.

The oral sucker is decidedly subterminal in position and shows a heavy musculature. It measures 220 to 250 μ in length by 180 to 230 μ in width. The oral opening is anterior and is directed toward the front. A short prepharynx leads into a well developed and muscular pharynx that measures about 60 μ in diameter. The esophagus is very short or absent, the ceca arising at the caudal boundary of the pharynx. The ceca are elongated tubes that pass through a highly irregular course to end very near the posterior extremity of the body. They contain food. The ventral sucker is considerably smaller than the oral sucker and lies from 400 to 500 μ behind the anterior margin of the body. It is highly muscular and measures from 160 to 200 μ long by 160 to 200 μ wide. The ventral sucker is very rarely round but is usually longer than wide, although the reverse may be the case. In stained specimens the gonads appear as slightly stained masses close to the posterior end of the body. The genital pore can be made out at the posterior end of an irregular mass of cells that extend forward through a flexed course to the level of the other germ masses. The ovary can be seen usually at the end of the mass of cells just described and appears to be intermediate in size between the two testes. One testicular mass, smaller than the ovary, lies immediately behind the ovary while the other testis is larger than the ovary or other testis and lies slightly in advance and to one side of the ovary. So far as could be made out the excretory system is typical for what is known of this system in this group of worms. The bladder is small and soon gives rise to the two main collecting tubules. These pass forward, laterally to the acetabulum, to the oral sucker where they turn posteriorly to retrace their course to near their point of origin. At this point each tubule branches a number of times and again passes forward to the region of the oral sucker. This last ascending tube branches an undetermined number of times before the level of the oral sucker is reached, and in a great many instances the secondary branches could be seen giving off smaller and smaller branches. The main parts of the excretory system are illustrated in Figure 3.

Unless otherwise stated all figures have been drawn with the aid of the camera lucida. (AC = acetabulum, B-G = brownish-green, B-Y = brownish-yellow, C = jelly-like cyst capsule, C.P = cirrus pouch, C.T = collecting tubule, E.B = excretory bladder, E.P = excretory pore, G.P = genital pore, G-Y = greenish-yellow, M = metacercaria, O = ovary, O-G = olive-green, R-B = rust-brown, RD-B = reddish-brown, T = testis, W = white, WR = wart-like protuberance, Y = yellow.)

Leucochloridium muscularae Wu, 1938

Wu, Liang-Yu 1938.
Parasitic trematodes of three sparrows,
Passer montanus taivanensis Hartert, - L.C. hua
from Canton, with a description of
three new species
Lingnan Sc. J. 17 (3): 389-394.
(Lingnan Univ.

Leucochloridium palawanense ~~sp. n.~~ Fischthal and Kuntz, 1973
(Figs. 1, 2)

HOST: *Pitta sordida sordida* (P. L. S. Müller), black-headed pitta (Passeriformes: Pittidae).

HABITAT: Small intestine.

LOCALITY: Puerto Princesa, Palawan Island, Philippines.

DATE: 22 May 1962.

SPECIMENS DEPOSITED: No. 72165 (holotype); No. 72166 (paratypes).

DIAGNOSIS (based on seven adult worms; six measured): Body elongate, relatively narrow, usually widest at acetabular level, extremities rounded, tegument entirely spined, 1,325–1,535 mg by 415–600 wide. Forebody 630–795 mg; hindbody 495–525 long; forebody–hindbody length ratio 1:0.65–0.79. Black pigment granules scattered throughout parenchyma. Oral sucker subterminal ventral, longer and slightly convex posteroventrally, somewhat shorter and slightly concave posterodorsally, rounded anteriorly, 235–270 by 190–235; prepral space 18–20 long in two slightly macerated specimens, 47–53 in normal specimens. Acetabulum round to longitudinally or transversely elongate, not filling intercecal space, 200–240 by 180–240, center at anterior four-sevenths of body length; sucker length ratio 1:0.79–0.91, width ratio 1:0.91–1.05. Prepharynx very short, not always apparent; pharynx usually contiguous with concave posterodorsal part of oral sucker, round to slightly longitudinally or transversely elongate, 131–148 by 118–153; esophagus thick-walled, muscular, 41–44 by 20–30, opening into expanded, thick-walled prececal sac (53–97 by 75–92); ceca surrounded by layer of cuboidal cells, lined internally with layer of columnar cells, constricted at point of emergence from prececal sac, passing dorsally and then anteriorly to sides of oral sucker (which it may overlap) before looping posteriorly, extending posttesticularly; postcecal space 36–77 long.

Gonads smooth, usually longitudinally elongate but one occasionally round, postacetabular, in triangular arrangement, testes usually contiguous with ovary but sometimes anterior testis separated by uterus. Anterior testis ventrosinistral, 104–130 by 90–109, lying 73–152 postacetabular; posterior testis dorsomedian, lying anterior to cecal ends by which it is more or less embraced, 114–130 by 94–125; posttesticular space 78–128 long. Seminal vesicle dextral, tubular, very thick-walled (5–13) with thin inner longitudinal muscle layer and thick outer circular muscle layer, winding, passing posteriorly ventral or just median to ovary. Pars prostatica straight, narrower and shorter than seminal vesicle, 60–110 by 26–28, walls thick (4–6) and muscular as for seminal vesicle, surrounded by large mass of gland cells, prostate cells numerous at junction with cirrus sac and smaller than gland cells. Cirrus sac thick-walled, muscular, longitudinally oval, 77–99 by 44–53, surrounded by gland cells. Cirrus muscular, sinuous posteriorly, anterior part inverted within cirrus sac, chamberlike, with long, slightly curved spines (8–19 by 2 at base), longest spines at bottom of chamber (at anterior end of cirrus when everted) and shortest anteriorly. Genital atrium shallow, small. Genital pore ventral, median to slightly submedian, 63–80 from posterior extremity, usually posttesticular but occasionally at posterior margin of posterior testis, at or just posterior to cecal ends.

Ovary dorsal, at same depth level as posterior testis, lying posterodextral to anterior testis and anterodextral to posterior testis, occasionally smaller or same size as either testis or larger than anterior testis, 106–123 by 92–111. Oviduct emerging from sinistrolateral margin of ovary. Ootype complex median to ovary and intertesticular. Vitellaria in lateral extracecal fields, extending from level of posterior margin of oral sucker or pharyngeal level to posterior testis level, terminating 153–225 from posterior extremity, well anterior to cecal ends, follicles ventral and lateral to ceca but not dorsal; transverse vitelline ducts emerging from near posterior end of each vitellarian field, uniting to form relatively large vitelline reservoir lying anterosinistral to posterior testis. Uterus with single ascending and descending limbs passing dorsal to acetabulum, ascending on right (rarely on left), descending on opposite side, coils many between posterior testis and oral sucker, without anterolateral loops extending prececally, transverse coils overlapping pharynx ventrally. Metraterm thick-walled, muscular, straight, longer than cirrus sac, lying sinistral to latter, opening into genital atrium. Eggs numerous, yellow near ovary, becoming slightly darker as they progress through uterus, operculate, 18 measuring 21–27 (23) by 12–14 (13).

Excretory bladder thick-walled, tubular, short, posttesticular; pore subterminal dorsal.

DISCUSSION: The distribution of the uterine coils separates our new species from all those that can be included in Kagan's (1952) concept of the genus *Urogoninus* Monticelli, 1888 (syn. of *Leucochloridium* Carus, 1835). Our form differs from Kagan's concept of *Leucochloridium* in lacking lateral prececal uterine loops. It differs from Kagan's new genus *Neoleucochloridium* (syn. of *Leucochloridium*) in lacking a pustulated cirrus and in having the uterine coils extending anterior to the cecal bifurcation. *L. palawanense* sp. n. differs from all known species in the genus in the shape of the oral sucker and presence of a thick-walled, muscular seminal vesicle, and from all but *L. cyanocittae* McIntosh, 1932 (syn. of *L. actitis* McIntosh, 1932) in having a spined cirrus. The latter species differs further in possessing prececal uterine loops on the sides of the oral sucker, the vitellaria extending postcecally or nearly so, and the anterior testis being near the posterior margin of the acetabulum.

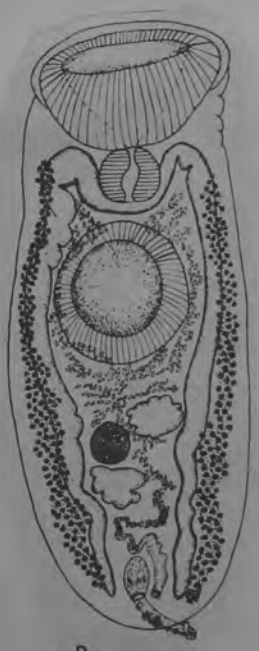
Leucochloridium papillocirratum ~~n. sp.~~ GROSCHAFT & SITKO, 1969

Host: *Rallus aquaticus* Linn.
Location: Cloaca
Locality: The Rod Pond (district of Jindřichův Hradec), southern Bohemia, Czechoslovakia.
Among the eight hosts examined, one was positive. Intensity of invasion, 9 adults and 1 juvenile trematode.

Description of the holotype: Body oval in shape, with maximum width in the area of acetabulum. Cuticle smooth, without spines, with very fine cuticular spinules only in the anterior part of the body. Body length 2.46 mm; body width 1.0 mm. Terminal oral sucker 0.48 by 0.68 mm. Pharynx well developed, 0.19 by 0.25 mm. Oesophagus absent. Intestinal branches connected directly with the pharynx from which they proceed to the mouth sucker and return, spiral-shaped, to the posterior end of the body. Acetabulum situated in the lower part of the anterior half of body, its upper margin touching the intestine in the place of its bifurcation. Anterior margins of both suckers 0.73 mm apart. Acetabulum 0.60 by 0.53 mm. Testes lobate, situated slightly transversal one behind the other but both passed by the longitudinal axis of body. Anterior testis 0.17 by 0.14 mm; posterior testis 0.18 by 0.19 mm. Ovary oval in shape, 0.14 by 0.11 mm. It is situated above the posterior testis in its close proximity. Uterus situated strictly intercoecal; by its ascending part, it passes the acteabulum on both sides, forming two loops at its upper level and returning in the same way towards the posterior part of the body, passing between the anterior testis and the ovary and passing between the cirrus sac and the left branch of the intestine. Lateral branches of uterus indistinct. Eggs relatively few in number, measuring 0.023 by 0.017 mm. Yolk clusters form very small follicles situated on the sides of body, mostly in the extracoecal zone. They occupy the whole area along the intestinal branches but do not exceed over them in either anterior or posterior part. Cirrus sac situated medial between the distal ends of intestinal branches; it is cup-shaped and measures 0.17 by 0.087 mm. Cirrus conspicuously big, well developed and measuring 0.30 by 0.06 mm. All along its length, it is covered with 21 globose papillae, the diameter of which is 0.036 mm in the proximal and 0.007 mm in the distal part of the cirrus.

Description of the paratypes (nine adult specimens): All adult specimens agreeing with the holotype in the shape of body. Cuticle of body smooth, with minute cuticular spinules in front of the sucker in some specimens. Oral sucker terminal, pharynx invariably well developed, oesophagus absent. Acetabulum invariably situated in the lower part of the anterior half of body. Upper margins of both suckers 0.65 to 0.82 mm apart. Intestinal branches of much the same course as in the holotype but not as distinctly spiral-shaped. Arrangement and shape of sexual glands as in the holotype but the lobate form of the testes more or less distinct. Uterus situated intercoecally in all cases, and in all directions at that, but less developed and with lower numbers of eggs in the paratypes. Yolk clusters of much the same character as in the holotype but sometimes reaching the upper or lower end of intestinal branches. Situation and shape of the cirrus sac as in the holotype but differing in size (*cf.* Tab. 1), the same as the cirrus which, in addition, shows different number of papillae (8 to 21). The dimensions of all specimens found are given in Tab. I.

A



B

Fig. 1. *Leucochloridium papillocirratum* n. sp. A — holotype, B — paratype, C — juvenile specimen, D — cirrus of the holotype

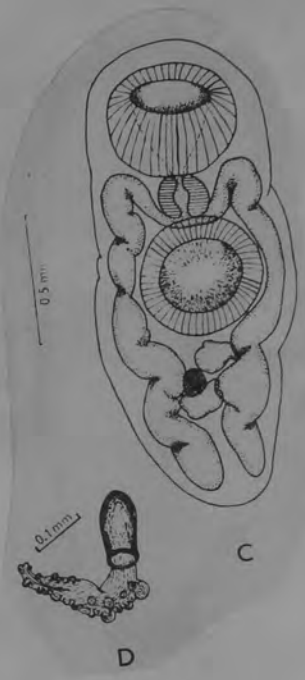
Tab. 1. Survey of body dimension of the *Leucochloridium papillocirratum* n. sp. (in mm)

Dimension of:	holotype	eight specimens of paratype	juvenile spec.
Body length	2.46	2.05—2.60	1.66
Body width	1.0	0.09—1.10	0.78
Oral sucker	0.48 × 0.67	0.48 —0.54 × 0.60 —0.70	0.44 × 0.48
Ventral sucker	0.60 × 0.53	0.55 —0.65 × 0.55 —0.70	0.45 × 0.48
Pharynx	0.19 × 0.25	0.18 —0.22 × 0.23 —0.30	0.17 × 0.21
Cirrus pouch	0.17 × 0.08	0.13 —0.25 × 0.07 —0.14	0.14 × 0.06
Cirrus	0.30 × 0.06	0.20 —0.40 × 0.05 —0.07	—
Testis I (anterior)	0.17 × 0.14	0.12 —0.17 × 0.13 —0.24	0.12 × 0.15
Testis II (posterior)	0.18 × 0.19	0.14 —0.18 × 0.15 —0.23	0.13 × 0.15
Ovary	0.15 × 0.12	0.10 —0.17 × 0.10 —0.17	0.11 × 0.10
Ova	0.023×0.017	0.023—0.027 × 0.015—0.019	—
Distance between suckeri	0.73	0.65—0.82	0.61

DISCUSSION

At the present time, the genus *Leucochloridium* Carus, 1835, compri 44 species (*cf.* Yamaguti, 1958). According to Bychovskaja-Pavlo skaja (1951), only *L. macrostomum* (Rud., 1819), *L. holostomum* (Rud., 18 and *L. actitis* McIntosh, 1932, are considered valid species. In our opini this viewpoint is justified. In identifying our specimens, we compared th with the original descriptions or redescriptions of some other members of genus *Leucochloridium*, *viz.*, *L. insigne* (Loose, 1899) — according to Lar (1943); *L. sime* Yamaguti, 1935; *L. turdi* Yamaguti, 1939; *L. cardis* Yam guti, 1939; *L. holostomum* (Rud., 1819) — according to Pavlov (1962); *L. risorisae* Neiland, 1953; and *L. phragmitophila* Bychovskaja-Pavlovsk et Dubinina, 1951.

L. papillocirratum n. sp. shows much similarity to *L. holostomum* (Ru 1819) and some species considered to be synonymous with this latter spe (*L. insigne* Looss, 1899; *L. flavum* Travassos, 1922; *L. turanicum* Solovi 1912). With these species, *L. papillocirratum* agrees in the shape of bo topography of organs, extent of yolk clusters and, with *L. insigne* (accord to Larios, 1943) and *L. flavum*, in the lobate shape of testes. From the la two species, however, *L. papillocirratum* differs by the absolute size of suckers. Larios (1943) states that in *L. insigne* found in *Querquedula disc* the uterus is situated intercoecal; it is evident from the illustration, howe that the uterus exceeds both intestinal branches laterally. The descripti

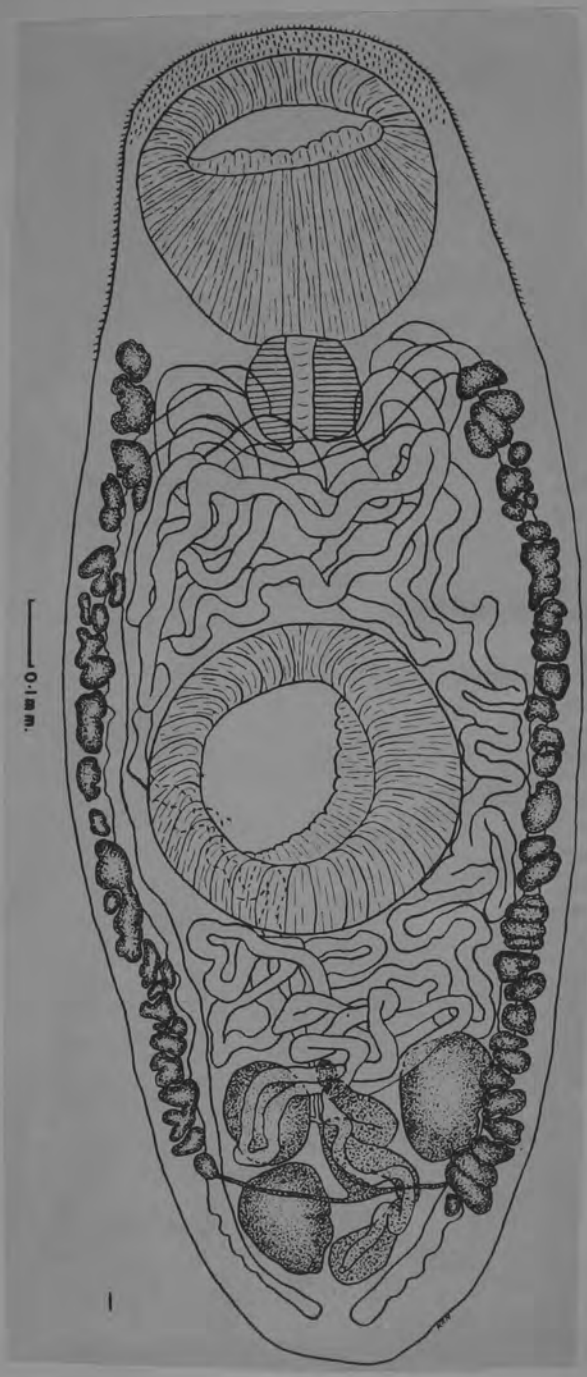


f the above species, however, do not state the size and shape of the cirrus. n *L. papillocirratum* n. sp., this organ is of so unusual shape and size that would hardly be overlooked as an important morphological character. While e acknowledge the validity of the results of Bychovskaja-Pavlovskaja 1951), evidencing the wide morphological variability of the members of the enus *Leucochloridium*, we have been led by the above-mentioned unusual hape of the cirrus as well as by the set of the above-mentioned additional ifferential characters to consider our discoveries to belong to a new species.

Leucochloridium passeri Wu, 1938

- same ref. as for L. macularis

Leucochloridium perisorisae Neiland, 1953



-OVER-

Leucochloridium perisorisae n. sp. (Fig. 1) NEILAND, 1953

Description: *Brachylaimidae.* Body slightly more than twice as long as broad, 1.42–2.02(1.80) long by 0.61–0.80(0.73) broad. Cuticle armed with small spines in region of pharynx and oral sucker. Oral sucker subterminal in position, 0.32–0.39(0.36) long by 0.35–0.42(0.40) broad. Acetabulum equatorial in position, approximately round, 0.39–0.46(0.42) long by 0.40–0.48(0.44) broad. Pharynx attached directly to oral sucker without intervention of prepharynx, 0.11–0.14(0.12) long by 0.13–0.17(0.15) broad. Esophagus lacking. Intestinal crura extend from pharynx to posterior end of body, ending behind level of posterior testis and vitellaria. Genital organs typical of genus. Testes variable in size and shape, showing gradations from almost round, about size of ovary, to elongate ovoid, about twice as large as ovary. One testis frequently larger than other, although on average they are approximately same size. Testes situated in posterior part of body, with most anterior one on left (in two specimens the most anterior testis is on the right side of the body). In all 27 specimens anterior testis separated from acetabulum by distance greater than that separating posterior testis from end of body. Anterior testis 0.13–0.28(0.19) long by 0.09–0.20(0.13) broad. Posterior testis 0.12–0.28(0.19) long by 0.07–0.19(0.12) broad. Cirrus pouch 0.10–0.17(0.13) long by 0.05–0.08(0.06) broad. Cirrus unarmed. Ovary approximately round, 0.12–0.15 (0.13) long by 0.09–0.15 (0.13) broad, usually situated directly anterior to posterior testis with which it may be contiguous. In some specimens ovary is placed slightly medial to posterior testis, while in one specimen it is almost directly in line with both testes. Oviduct passes mesially from ovary to connect with common vitelline duct before turning anteriorly on right side as uterus (a fecundarium is present, but its connection with the oviduct was not observed). Uterus ascends from region of ovary through number of convolutions past right side of acetabulum into pre-acetabular region where it is always more or less extra-caecal near pharynx. Uterus then proceeds posteriorly on left side of acetabulum into region of genital organs where it opens through genital pore, situated at posterior tip of posterior testis, in region between ends of ceca. Eggs oval, 0.020–0.025(0.023) long by 0.011–0.013(0.012) broad. Vitellaria ventral (sometimes slightly but never completely lateral) to intestinal ceca and extend from level of pharynx to level of anterior tip of posterior testis. Collecting ducts pass mesially from posterior limits of vitellaria to unite near midline of body, forming common vitelline duct which may or many not be enlarged to form vitelline reservoir.

Host: Perisoreus o. obscurus Ridgway (Oregon Jay).

Habitat: Intestine.

Locality: Oakville, Washington.

Type: Slide No. 37199, bearing the type specimen has been deposited in the Helminthological Collection of the U. S. National Museum.

Apparently in all the recognized species of *Leucochloridium* the posterior extent of the vitellaria and intestinal crura are very nearly the same. In contrast to this situation, in *Leucochloridium perisorisae* n. sp. the intestinal crura extend well past the posterior limits of the vitellaria in all of the 27 specimens examined. The new species may be separated from the more closely related species of the genus as follows:

Leucochloridium melospizae McIntosh, 1932, and *L. paradoxum* Carus, 1835, both have oral suckers which are larger than the acetabulum, while in *L. perisorisae* n. sp. the situation is reversed.

Leucochloridium passeri Wu, 1938, has a nonspinose integument while in the new species there is a marked spination in the region of the oral sucker.

Leucochloridium australiense Johnston and Simpson, 1940, has a markedly different distribution of its vitellaria. In this species the vitellaria are extra-caecal and they extend from the middle of the oral sucker to the posterior limits of the posterior testis. In *L. perisorisae* n. sp. the vitellaria invariably overlap the intestinal crura (in a few specimens the overlapping is not complete and there is slight lateral displacement) and they begin at the level of the pharynx and end before reaching the caudal boundary of the posterior testis.

SUMMARY

A new species of *Leucochloridium* Carus, 1835, is described from the Oregon jay, *Perisoreus o. obscurus* Ridgway. A discussion of some of the characters for species separation and of the application of life history studies to the taxonomy of this group is presented. The relationhips of *Leucochloridium perisorisae* n. sp. to other members of the genus are discussed.

SEE REPRINT OR J.P. 39(5): 553-557

Leucochloridium perturbatum sp. n.

Body oval with both ends rounded (Fig. 1), maximum width (equal to half of body length) in the middle of the body. Dimensions: 1.80×0.94 mm. Cuticula finely spinose. Suckers almost equal: oral 0.46×0.45 mm, acetabulum 0.47×0.47 mm. Centre of acetabulum beyond the middle of body. Pharynx (0.17×0.19 mm) of the size of ovary. Intestinal caeca form and arch which extends up to the posterior edge of oral sucker. They do not extend to the posterior body end. Gonads small, arranged in a triangle. Anterior testis (0.15×0.19 mm) dextral, extends to the posterior adge of the acetabulum. Ovary (0.17×0.17 mm) at the level of anterior testis, sinistral. Posterior testis (0.14×0.13 mm) just beyond the ovary. Cirrus pouch (0.21×0.13 mm), oval, in midline, between terminal sectors of intestinal caeca. Genital pore dorsal. Vitellaria of small follicles, in the anterior part overlap the caeca and extend to the intracaecal space. They extend from half of the oral sucker, to about the end of the caeca slightly exceeding it on one side. Uterus exceeds anteriorly the intestinal arch but does not reach the range of the vitellaria. It partly covers the caeca on both sides.

The spatial arrangement of organs: oral pore on the ventral side leads to the pharynx. Caeca nearer the dorsal side. Testes and ovary at the same plane, nearer midle of the body. Cirrus pouch more dorsal than gonads, somewhat obliquely to the longitudinal crossection line, opens to the dorsally situated genital sinus. Uterus extends from the ootype on the dorsal side (the first loops lie most dorsally compared to other organs), but the first ascending limb forms numerous loops occupying the width of the body. It turns to the right between the acetabulum and the pharynx, ventrally towards caeca and pharynx. It forms similar loops on the right side and turns again to the left at the level of the posterior end of acetabulum, forms a big loop which may extend from the middle of the acetabulum to the posterior testis. It returns in vertical spirals to the right side and forming numerous loops in the area free from gonads, descends to the genital pore on the right side of the cirrus pouch. Posterior loops (beneath the acetabulum) ventrally to the gonads, only the last part turns to the dorsal side, and there terminates in the genital sinus. The vitellaria form a kind of gutter which on the ventral side overlaps the caeca and partly the gonads and uterus. Near the lateral margin it laps over the dorsal side encircling the external edges of caeca. The vitellaria are thus situated most ventrally and dorsally.

The variability was studied in experimental specimens, at least nine days old and those from natural infection which has a well developed uterus, but not covering other organs. The variability of dimensions is shown in Table V.

Body size and shape. The length of experimental specimens varies from 0.84 to 2.20 mm, and of those from natural infection was from 1.25 to 2.15 mm. In spite of the wide range of body length variability the population in the host was equal (Table VI). The maximum width is usually in the middle of the body length. In general the width is half of the length but even in one host the differences occurred. The ratio of length to width was as follows:

experimental populations		natural populations	
range	mean	range	mean
1.6—1.7 : 1	1.65 : 1	1.8—1.9 : 1	1.8 : 1
2.3—3.5 : 1	2.5 : 1	1.7—2.0 : 1	1.9 : 1
1.6—2.3 : 1	1.8 : 1	2.0—2.1 : 1	2.0 : 1
1.8—2.6 : 1	2.1 : 1	1.9 : 1	1.9 : 1
1.8—2.2 : 1	1.9 : 1	1.5—2.4 : 1	2.0 : 1
1.9—2.0 : 1	1.9 : 1	1.8—2.3 : 1	2.2 : 1
1.7—2.1 : 1	1.9 : 1		

Fig. 1. *Leucochloridium perturbatum* sp.n. — holotype (from natural infection)

Table VI

Length of *Leucochloridium perturbatum* sp. n. in mm

Experimental populations				Natural populations		
No. of specimens	Age in days	Host	Dimensions	No. of specimens	Host	Dimensions
5	13—29	sparrow	1.02—1.50	5	starling	1.37—1.42
7	11—16	"	1.16—1.40	5	"	1.94—2.15
12	18	"	0.84—1.26	2	"	1.50—1.70
3	16—39	"	1.43—1.65	3	thrush	1.76—1.80
10	13	starling	1.45—1.60	27	starling	1.25—1.47
4	16	thrush	1.37—1.55	10	thrush	1.27—1.56
5	20	gull	1.70—2.20			

(see also next page)

syns: *Leucochloridium* sp. Pojmanska, 1962
"sporocyst E" of Pojmanska (1962)
"sporocyst C" of Pojmanska (1962)

Pojmanska (1968)
- corrs. paper has many drawings of adults from nat. & exp. infections.

Variations from the shape of the lectotype: slimer trematodes (Fig. 2 a), barrel-like specimens definitely wider than the half of length (Fig. 2 b), specimens with narrowing posterior body (Fig. 2 c), and with maximum width in the anterior part of the body (Fig. 2 d).

Arms. Fine spines all over the body, cirrus armed.

Suckers. In specimens aged from 8 to 39 days the oral sucker was 0.25—0.50×0.26—0.48 mm; acetabulum 0.24—0.49×0.28—0.50 mm. The size depended on the age and size of the trematode, yet there were differences in trematodes of the same age and similar dimensions. The analysis of old (from experimental material) and big (from natural infection) trematodes suggests that suckers grow most during the first dozen days. Thus neither the dimensions of suckers nor their ratio to the body size are good specific features. The ratio of the oral sucker to acetabulum is relatively stable (as in *L. paradoxum* Carus, Pojmańska 1966), about 1 : 1 for mature trematodes. The relative size of suckers slightly differs with age. In most metacercariae and several- day old trematodes the oral sucker is bigger than acetabulum (Table VII). The size ratio of suckers is a good specific feature, particularly in a numerous population.

Pharynx large in metacercariae and it does not grow much in the adult. So its ratio to the other dimensions changes during the growth of the trematode. In adults the pharynx is usually somewhat smaller than the gonads.

Caeca. The intestinal arch usually quite high, extending to the posterior end of the oral sucker or further. The caeca extended posteriorly to the end of the body. A few exceptions were observed.

Gonads arranged in a triangle, occupied posterior part of the body. The anterior testis often overlapped the region of acetabulum. Ovary sinistral, somewhat beneath the anterior testis, did not reach the acetabulum. Posterior testis was just beyond the ovary, and sometimes overlapped its posterior edge. The size of gonads depended on the age and physiological activity. The gonads anlage in metacercariae are of almost equal size. In adults the anterior testis is usually the biggest, the ovary and posterior testis being somewhat smaller. Quite often the ovary is smaller than the testes. (Fig. 2a)

Cirrus pouch. The size and situation of cirrus pouch in the experimental material was quite invariable and is regarded as a good specific feature. The size similar to that of gonads. Out of 84 specimens it was smaller than the smallest gonad in 14 specimens (Fig. 2d), equal to one in 42 specimens (Fig. 2e), larger than the biggest gonad in 28 (Fig. 1). The cirrus pouch usually elongated (Fig. 1) sometimes almost spherical (Fig. 2e). It was situated on the longitudinal axis or somewhat obliquely or even transversal between the ends of caeca, sometimes overlapped the region of posterior testis. The genital pore usually dorsal. Out of 56 specimens 39 had dorsal, 15 subterminal and 2 a terminal pore.

Vitellaria. The anterior part extended over the intestinal arch, the posterior varied. Both strands often asymmetrical. Out of the 53 specimens, there were 8 with strands reaching to the end of caeca (Fig. 2c), 19 with strands extending farther (Fig. 2b) and 10 with strands so long that they almost merged with each other (Fig. 3a). Asymmetric arrangement was seen in 16 specimens, and in 5 of them one strand did not reach the end of caeca (Fig. 8a and 8b).

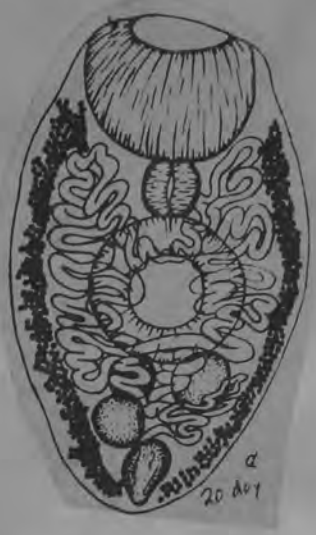
Uterus. In mature specimens the uterus occupied the whole intracaecal area. Only one flat loop of the uterus on each side went beyond the bifurcation of caeca and it either insignificantly overlapped the region of oral sucker or did not overlap it at all (Figs. 1 and 2b). On both sides the uterine loops usually extended to the external edge of caeca and thus overlapped the vitelline strands. The uterine loops often reached the anterior end of vitelline strands (Fig. 2c). Size and shape of eggs as in other *Leucochloridium* species.

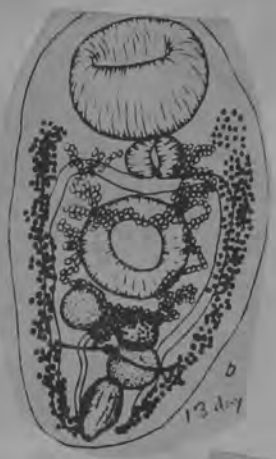
Table VII

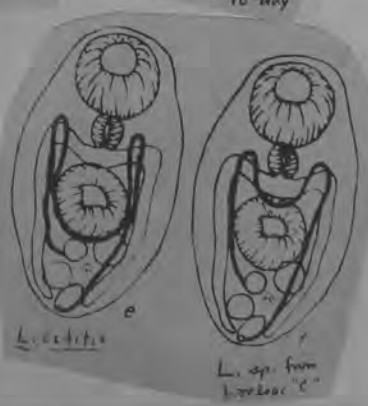
Size ratio of oral sucker to acetabulum in *L. perturbatum* sp. n. depending on age

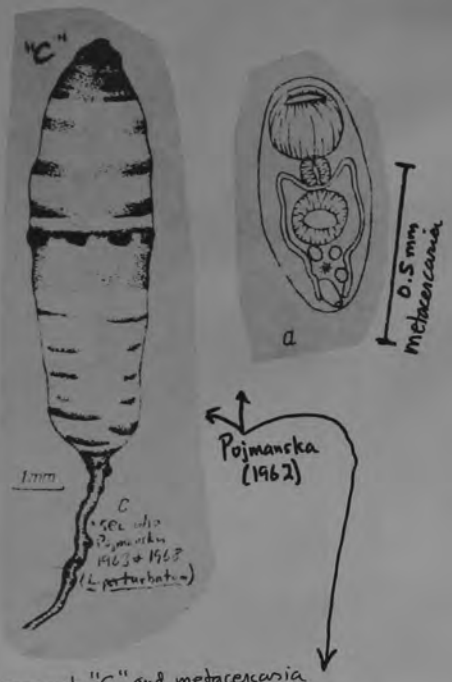
Age in days	No. of measurements	Ratio of oral sucker to acetabulum	Average ratio of oral sucker to acetabulum
Metacercaria	49	0.95—1.69 : 1	1.10 : 1
1	87	0.93—1.48 : 1	1.08 : 1
2	15	0.87—1.27 : 1	1.07 : 1
3	3	1.07—1.10 : 1	1.08 : 1
4	2	1.07—1.29 : 1	1.12 : 1
5	9	1.05—1.16 : 1	1.10 : 1
6	6	1.00—1.21 : 1	1.07 : 1
8	1	1.14 : 1	1.14 : 1
9	3	1.01—1.12 : 1	1.08 : 1
11	1	0.93 : 1	0.93 : 1
12	1	1.03 : 1	1.03 : 1
13	12	0.95—1.07 : 1	1.01 : 1
16	11	0.91—1.14 : 1	1.05 : 1
18	12	0.84—1.05 : 1	0.99 : 1
20	1	1.03 : 1	1.03 : 1
39	2	0.98—1.00 : 1	0.99 : 1

-all from Pojmanska (1968)









- sporocyst "C" and metacercaria from Pojmanska (1962)

Leucochloridium sp. — sporocyst C (Fig. 1c)

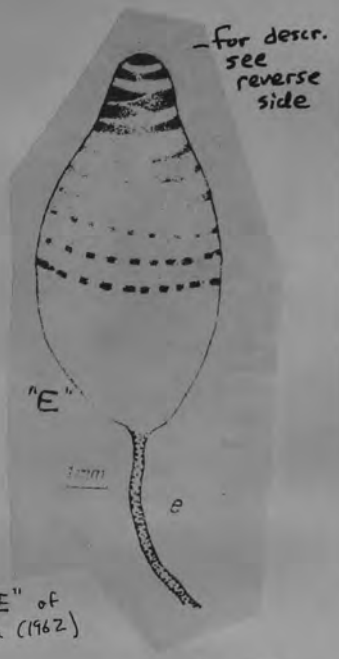
Found only once in Dziekanów Leśny in September 1961. The snail contained two coloured sacks.

Length of sack is about 8 mm, width 1.5 mm. Cylindrical shape. The distal end is slightly pointed. The proximal end passes into a tail, which is thick at the base and gets slowly narrow. Yellowish sporocyst with brown rings of various shades. Grayish, dull colours. The coloured rings appear on the whole sack length although not so distinctly as in sporocyst A. Coloration of the sporocyst: Five dark-brown (chocolate) spots on the distal end, slightly protruding on a clearer background. On the same background there are two dark-brown rings (the same as the spots). Further on, there are four yellowish rings (very clear, nearly white) alternating with four brown ones. Each successive brown ring is slightly darker than the former. The last one is of the same colour as the spots on the tip. Dark-brown spots, slightly protruding, are lying on its external edge similarly as on the tip. The described drawing occupies less than the half of the sack length. Slightly darker rings lie further on a yellowish background. They become darker near the proximal end and cleared at the distal part of the sack. The tail is brown with small but strongly protruding spots of the same colour.

Over 100 metacercariae in a sack. They are small, covered with tiny spines, and are large at the front body end and narrowing towards the rear (Fig. 2a). This was the smallest metacercaria ever observed by myself (dimensions in Table I). Oral sucker bigger than the ventral one, big pharynx, narrow intestines reaching nearly the posterior end of the body. Genital glands, situated in a triangle, are of nearly equal size. „Round body" distinctly visible. Cirrus pouch outlined.

L. perturbatum Pojmanska, 1968

--continued (see previous page)



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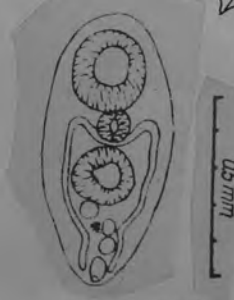
Sporocyst E" of Pojmanska (1962)

metacercaria from "E"



-Pojmanska (1962)

Leucochloridium sp. — sporocyst E (Fig. 1e)

Found only once in Białowieża in August 1958. The snail contained one mature sack.

Length of sack about 8 mm, width 1.5 mm. Barrel-shaped, with narrowed and distinctly separated cap. Tail long and narrow, slightly wider at the base. Coloration light-creme, rings yellow and brown. Intensive colours. Drawing of the sporocyst: Dark-brown (chocolate) distal end, followed by three fairly large rings of the same colour. The last ring separates the narrowed „cap" from the rest of the sack. In the next enlarged part there occur three narrow, not very distinct, orange-brown rings and further on three, distinctly brown rings. Each successive ring is darker than the former one. The last ring is similar in colour to those on the „cap". These three rings are not uniform. They are composed of brown spots separated by narrow, vertical, creme fields. The proximal part of the sack has a uniform creme coloration, whilst on the tail there appear small spots having a colour of the first ring of the third series of rings.

The shape of this sporocyst resembles the orange sporocyst of Woodhead 1935 found also by Ginecinskaia 1954, but differs from it mainly by the coloration and drawing.

The sporocyst contains about 100 metacercariae. They are of middle size (dimensions in Table I), covered with small, oval spines, but more barrel type than the formerly described ones (biggest width at the middle of body length) (Fig. 2c). Ventral sucker slightly smaller than the oral one. Its centre lies slightly behind the middle of the body. Big pharynx, intestines reaching nearly the end of the body. Genital glands situated in an obtused-angle triangle; front testis touches usually the rear edge of the ventral sucker; the ovarium lies behind it on one line with the back testis. The ovarium is usually slightly smaller than the testes. „Round body" and cirrus pouch well visible.

	length	width	oral sucker	ph.	ventral sucker	ratio	tester I	tester II	ovary
Sporocyst e	639-756	306-385	198-243 × 198-243	81-99 × 90-99	162-189 × 189-207	1:1.14	37-52 × 37-57	32-45 × 32-42	37-40 × 32-40

VS: 05

Leucochloridium philippinense ~~sp. n.~~ Fischthal and Kuntz, 1973
(Fig. 3)

HOST: *Pitta s. sordida.*
HABITAT: Small intestine.
LOCALITY: Puerto Princesa.
DATE: 22 May 1962.
SPECIMEN DEPOSITED: No. 72167 (holotype).

DIAGNOSIS (based on one worm): Body elongate, somewhat broad, widest at acetabular level, extremities rounded, tegument entirely spined, 1,452 long by 650 wide. Forebody 660 long; hindbody 410 long; forebody–hindbody length ratio 1:0.62. No black pigment granules in parenchyma. Oral sucker subterminal ventral, nearly round, 302 by 290; preoral space 70 long; acetabulum round, nearly filling intercecal space, separated from ceca by uterine coils, 382 by 385, center at anterior three fifths of body length; sucker length ratio 1 1.26, width ratio 1:1.33. Prepharynx not apparent; pharynx nearly round, 100 by 110 overlapping oral sucker dorsally; esophagus very short; no prececal sac; ceca surrounded by layer of cuboidal cells, lined internally with layer of columnar cells, slightly ascending side of oral sucker, extending to near posterior extremity; postcecal space 77 long.

Gonads smooth, longitudinally elongate, at same depth level; ovary and anterior testis lying just postacetabular, symmetrical; posterior testis mediodiagonal to other gonads; anterior testis sinistral, 155 by 116; posterior testis dextral, lying anterior to cecal ends, 142 by 107; posttesticular space 130 long. Seminal vesicle intertesticular, mediosinistral, tubular, very thick-walled (6–14) with thin inner longitudinal muscle layer and very thick outer circular muscle layer, slightly curved, 143 by 46, commencing at overy–anterior testis level. Pars prostatica elongate oval, 41 by 24, walls thick (5) and muscular as for seminal vesicle, narrowing for short distance before entering cirrus sac, surrounded by large mass of gland cells. Margins of cirrus sac obscured by eggs. Cirrus muscular, unspined, smooth. Genital atrium shallow, small. Genital pore ventral, median, postcecal, 60 from posterior extremity.

Ovary dextral, 109 by 82. Oviduct emerging from sinistrolateral margin of ovary. Ootype complex median to ovary, intertesticular. Vitellaria in lateral extracecal fields, extending from level of posterior part of oral sucker to level of anterior part of posterior testis, terminating 250 from posterior extremity, well anterior to cecal ends, follicles ventrolateral to ceca but not dorsolateral or dorsal; transverse vitelline ducts emerging from near posterior end of each vitelline field, uniting to form large vitelline reservoir lying intertesticular. Uterus with single dextral ascending and sinistral descending limbs passing dorsal to acetabulum, coils many between acetabulum and posterior margin of oral sucker, without anterolateral coils extending prececally, with few coils postacetabularly, ascending and descending between ovary and anterior testis, descending further intertesticularly, much coiled sinistral to posterior testis, with coils between latter, cecal ends, and posterior extremity. Metraterm thick-walled, muscular, partly posterior to left cecum, lying sinistral to cirrus sac, surrounded by gland cells. Eggs numerous, yellow-brown, operculate, 10 measuring 21–27 (24) by 12–14 (13).

Excretory bladder thick-walled, tubular, short, posttesticular; pore subterminal dorsal.

DISCUSSION: This species differs from Kagan's concepts of the genera *Urogonimus*, *Neoleucochloridium*, and *Leucochloridium* as discussed for *L. palawanense*. In having a thick-walled, muscular seminal vesicle the present form differs from all species of the genus except *L. palawanense*. *L. philippinense* differs from the latter in the shape of the oral sucker having the acetabulum larger than the oral sucker, lacking a prececal sac, the ovary and anterior testis being just postacetabular, and possessing an unspined cirrus and posttesticular uterine coils. Our form closely resembles *L. turdi* Yamaguti, 1939, which differs further in its more posteriorly placed genital pore and the anteriormost extent of the uterine coil being at the cecal bifurcation. In the posttesticular extension of the uterine coils and posterior extent of the vitellaria in relation to the cecal ends, our form also resembles *L. dasylophi* Tubangui, 1928, *L. hypotaenidiarum* Tubangui, 1927, and *L. nainitalensis* Baugh 1962; these species differ further from our form in having the acetabulum equatorial and the gonads lying far posterior to the acetabulum. *L. dasylophi* also differs in having a dorsal genital pore and larger eggs; *L. hypotaenidiarum* in the posterior testis being far anterior to the cecal ends, the genital pore dorsal, and the vitellaria extending posttesticularly; and *L. nainitalensis* in the vitelline fields commencing postpharyngeally.

Leucochloridium phragmitophila Bykhovskaia & Dubinina, 1951

Bykhovskaia, I. E. (Pavlovskaia) & M. N. Dubinina 1951.
[Leucochloridium phragmitophila sp. nov. from sparrows]
[Russian Text]
Dokl. Akad. Nauk SSSR an. 19, n.s., 76 (1): 161-162

Leucochloridium sime Yamaguti, 1935

Yamaguti (1935)

9. ***Leucochloridium sime**** n. sp.

SPECIFIC DIAGNOSIS. *Leucochloridium* Carus, 1835. Body 1.1–1.27 mm long, 0.5–0.62 mm broad at about middle of body. Oral sucker subterminal, 0.38–0.43 mm in diameter, constantly larger than acetabulum. Pharynx 0.12–0.13 × 0.13–0.15 mm. Prepharynx and esophagus short. Acetabulum 0.35–0.38 mm in diameter; its center just behind middle of body. Ceca terminating short of posterior end of body. Testes and ovary arranged in a triangle, subglobular or oval, almost similar in size, 0.06–0.1 × 0.075–0.125 mm. Cirrus pouch 0.1–0.15 mm in diameter. Uterus extending to level of anterior end of vitellaria or a little more forward. Eggs asymmetrically oval, 24–30 × 14–20 μ. Vitelline gland extending from level of posterior part of oral sucker to posterior end of body.

* The specific name refers to the Japanese name of the host.

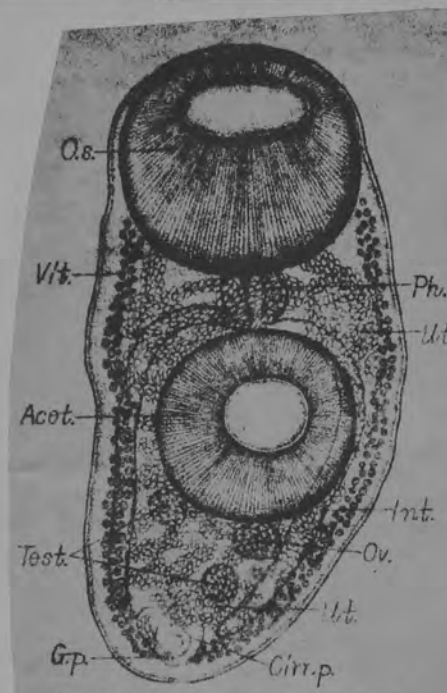


Fig. 12. *Leucochloridium sime*, ventral view. Type 1.2 × 0.58 mm.

Habitat. Cloaca of *Coccothraustes coccothraustes japonicus*.

Locality and date. Sizuoka Prefecture; December 23, 1933.

Type and paratypes in my collection.

DISCUSSION. According to Mc Intosh's key to species of *Leucochloridium*, the present worm is most closely related to *L. variae* McIntosh, 1932, but differs from it in the relative size of the oral and ventral suckers. Recently Ishii has described a new *Leucochloridium* (*L. japonicum*) from *Graphophasianus soemmerringii*. This species is, however, characterized by the vitellaria terminating at the level of the ovary and by the postequatorial position of the acetabulum, and its eggs measure 22–25 × 12–13 μ, so that it can safely be neglected here.

Leucochloridium skrjabini Shaldybin, 1954

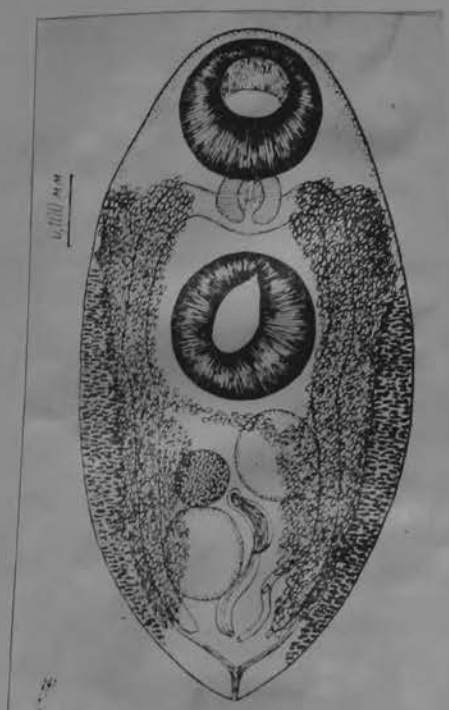


Fig. 1. *Leucochloridium skrjabini* nov. sp.

Shaldybin, L.S. 1954a
[New trematodes from insectivores]

Hosts: Sorex araneus
Sorex minutus
Neomys fodiens

I doubt this is Leucochloridium - PDL
note excr. pore part. to g. pore

This species is characterized by a pre-equatorial acetabulum, the erus confined to intercecal area, and the posterior testis situated at considerable distance from posterior extremities of vitellaria and intestinal crura.

Type specimen.—U. S. Nat. Mus. Helm. Coll. No. 32396.

Host.—Porzana carolina (sora rail).

Location.—Intestine.

Locality.—Minnesota (Rice Creek, Minneapolis).

Leucochloridium sorae McIntosh, 1927

Length 2·5596 mm.; width 0·8748 mm., measurement taken at acetabulum; **entral surface** of body flat, dorsal surface convex, tapering at posterior end, **therwise** about the same breadth throughout. Suckers about equal in **iameter**; anterior sucker 0·534 by 0·5994 mm.; acetabulum 0·5832 by 0·5994 mm. **ituated** anterior to middle of body. Pharynx 0·1701 by 0·2106 mm. Anterior **estis** oval, 0·150 by 0·225 mm., on right side of body, and about twice its **ength** (0·30 mm.) from acetabulum. Posterior testis a little smaller, 0·112 **y** 0·17 mm., on left side of body, and removed from zone of anterior testis **or a distance** greater than its length. Ovary 0·104 by 0·150 mm., anterior to **osterior testis**; fields of these two organs in contact and may overlap slightly. **Uterus confined** to intercoecal area. Cirrus sac large, length 0·176 mm., dia**neter** 0·110 mm. Anterior part of vas deferens enlarged, forming seminal **esicle.** Genital pore dorsal and median, near posterior end of body. Cirrus **rotruding** from genital atrium, measuring 0·128 by 0·060 mm. Uterus entering **enital** atrium on right side from cirrus sac. Eggs yellowish-brown, 0·0226 **y** 0·0152 mm. Excretory pore dorsal, 0·064 mm. from posterior end.

Habitat: Intestine of Sora Rail (*Porzana carolina*).

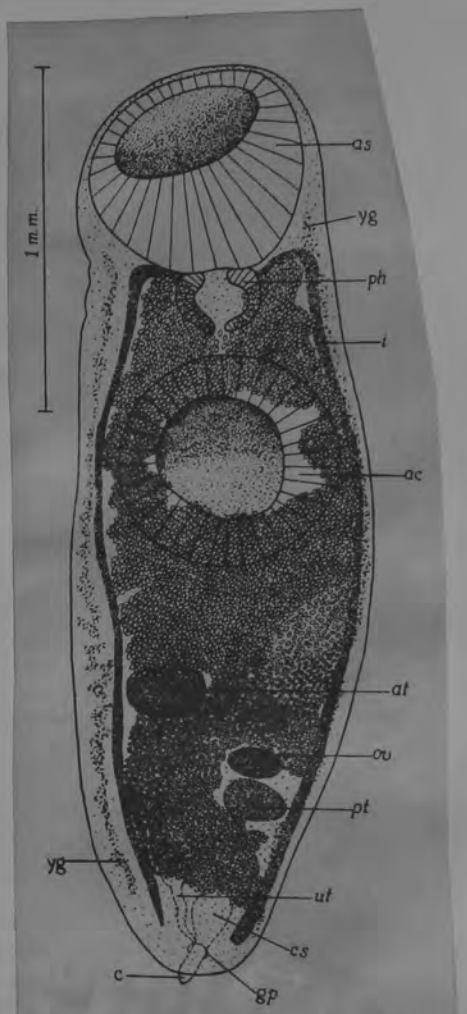


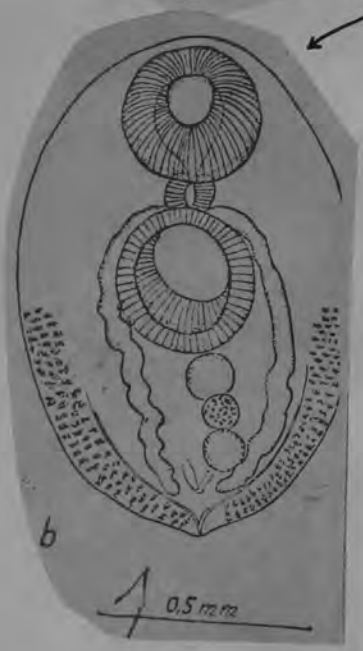
Fig. 5. *Leucochloridium sorae* n. sp., ventral aspect.

Soltys (1952)

Syn. **Leucochloridium soricis** Soltys, 1952

Leucochloridium soricis sp. n.

Oval body, flattened; length 1.7 mm broad. 0,9 mm. The anterior part of the body usually rounded, the hind one narrowed. A large ventral sucker up to 0,38 mm., the oral sucker 0,40 mm. Pharynx 0,12 mm. Testicles round 0,16 mm. Ovary also round 0,12 mm. Sexual glands are localized behind the ventral sucker in one longitudinal line. Vitellaria extend from the posterior end of the ventral sucker and reach near the end of the intestine. The uterus fills up the whole space from the upper bifurcation of the intestine to the posterior (hind) testicle, and at the sides it reaches the vitellaria, pushing aside the branches of the intestine .Eggs of the size 0,033 x 0,016 mm. The sexual opening is located on the ventral side in the hind part of the body, between the ends of the branches of the intestine. The excretory system is extracoecal, the excretory foramen lies in the hind part of the body, in its terminal part on a slight prominence situated towards the dorsal side.



Soltys (1952)

Pseudoleucochloridium soricis (Soltys 1952) Pojmańska 1959*

Syn.: *Leucochloridium soricis* Soltys 1952.

Morphology: The description of a mature metacercaria was given in a previous paper (Pojmańska 1959). In the later materials I found also young forms which, similarly to the other representatives of the subfamily *Brachylaimidae*, possessed a tail.

The adult trematode does not much differ from the metacercaria. The size of the trematode and of all internal organs enlarges slightly, the parasite, and especially its hind part, becomes longer; therefore the centre of the ventral sucker is shifted to the front part of the body. Genital organs, contrary to metacercaria, have a fairly permanent size, shape and arrangement. Testes and ovary spherical or slightly elongated, ovary a little smaller than the testis. The arrangement of vitellary glands does not change. Uterus has the same course as in metacercaria and fills out the entire free fields between the vitellary glands, but not covering the ventral sucker and the genital glands (Fig. 2, Table VI). In this table for a comparison there are also given the dimensions of *L. skrjabini* Shaldibin 1953.

The included dimensions do not sufficiently differ from those of other authors.

Development: The whole life cycle of *P. soricis* is not known. Those metacercariae found in Białowieża were in different stages of development, some of them were still very young and posessed a tail. This is one more evidence that *P. soricis* can not be included to the genus *Leucochloridium*. It can be supposed that the development of this trematode is similar to that of other representatives of *Brachylaiminae*.

The maturation of trematodes in the final host, although the metacercaria is much advanced in its development, probably does not proceed to fast because the number of young flukes is fairly large in comparison with all trematodes found in shrews.

Intermediate hosts: Metacercaria of *P. soricis* occurred in Białowieża in *Succinea putris*, *Perforatella bidens*, and *Zenobiella rubiginosa*. Besides, it was found in the collection of Kazubski in *Lacinaria gulo*, *Iphigena latestriata*, *Zenobiella vicina*, *Perforatella dibothrion*, and *Trichia bielzi*. The extensiveness of invasion is shown in Table VII.

Final hosts: In Białowieża *P. soricis* parasitizes (after Soltys) *Sorex araneus araneus* and *Neomys fodiens*; Stammer 1955 found it also in *Crocidura leucodon*. If *L. skrjabini* is a synonym of this species, *S. minutus* should be included to the list of its hosts.

Pojmańska (1961)

* To the synonyms also *L. skrjabini* Shaldibin 1953 should be included (Pojmańska 1959).

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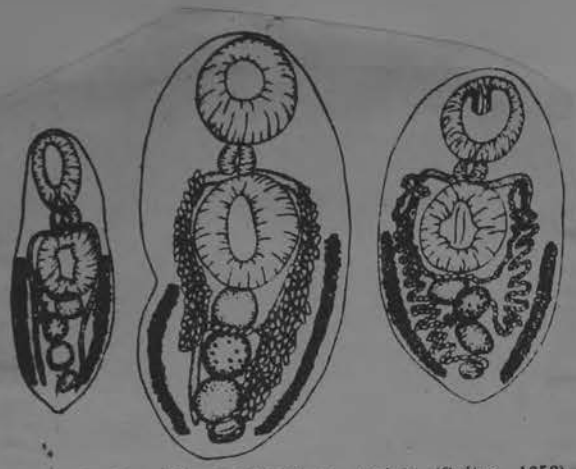


Fig. 2. *Pseudoleucochloridium soricis* (Soltys 1952) Pojmańska 1959

Table VI

Measurements of P. soricis and L. skrjabini

Organs	Pseudoleucochloridium soricis		Leucochloridium skrjabini (after Shaldibin)
	metacercaria	adult form	
Length	0.72 - 1.6	0.79 - 1.24	0.95 - 1.53
Width	0.52 - 0.96	0.51 - 0.66	0.47 - 0.63
Oral sucker	0.21 - 0.32 0.22 - 0.43	0.22 - 0.32 0.22 - 0.30	0.20 - 0.48
Ventral sucker	0.24 - 0.46 0.25 - 0.49	0.20 - 0.35 0.18 - 0.36	0.22 - 0.48
Pharynx	0.07 - 0.12 0.10 - 0.16	0.10 - 0.11 0.09 - 0.13	0.10 - 0.15
Testis I	0.06 - 0.18 0.08 - 0.15	0.11 - 0.15 0.10 - 0.15	0.10 - 0.11 0.36
Testis II	0.06 - 0.13 0.06 - 0.15	0.10 - 0.15 0.11 - 0.15	0.15 - 0.15 0.15 - 0.17
Ovary	0.05 - 0.16 0.07 - 0.13	0.11 - 0.17	0.08 - 0.15 0.08 - 0.14
Eggs		0.02 - 0.03 0.013-0.016	0.027-0.015

-Pojmanska (1961)

No holotype was determined because the only material available is that obtained in the laboratory. As the variability of material was insignificant, only collective description of 38 specimens was made. The data below pertain to 33-day old adult.

Leucochloridium subtilis sp. n

Trematodes small (see Table II), slim (Fig. 1 d), anterior end wide and blunt, posterior end rounded. Maximum width from the line of the posterior end of oral sucker to the posterior end of acetabulum, farther it rapidly narrows down. The cuticle covered with very small spines. Suckers relatively large, together with pharynx they occupy over two thirds of body length. Oral sucker larger than acetabulum (Fig. 1 d). The centre of the acetabulum below the middle of the body. Pharynx as large as the gonads or larger. Caeca form anteriorly a small arch which does not reach the region of oral sucker, posteriorly they do not reach the body end. Gonads are spherical of almost equal size. Anterior testis and ovary are almost in one line and generally overlap the posterior edge of the acetabulum. The posterior testis just beyond the ovary, more centrally situated. The cirrus pouch long, slimm, its width less than half of its length. It is often twice as long as the diameter of the biggest gonad. Genital pore usually subterminal, uterus fills the intracaecal space and only in some specimens reaches a little farther than the intestinal bifurcation. Vitellaria extend from the mid-line of oral sucker clearly farther than caeca. Their bands are not very wide, they usually cover the caeca.

Individual variability

Length 0.97 — 1.31 mm; most specimens from 1.04 — 1.10 mm (12 out of 38). Width 0.44 — 0.63 mm, usually below half of the length with some exceptions as in Fig. 2 a and 2 d.

Suckers. The size ratio of oral sucker to acetabulum is 0.95—1.20 : 1. The average (1.11 : 1) almost identical with the most frequent (1.10 : 1). In two specimens oral sucker was smaller (Fig. 2 d), and in three both were equal (Fig. 2 a). In most specimens oral sucker ventral and its longitudinal axis was larger than transversal (Fig. 2 b). Acetabulum usually transversally elongated (Fig. 2 a) but in over a dozen worms it was round (Fig. 1 d). The trematodes being slim, the acetabulum occupied almost the whole intracaecal space. The size ratio of oral sucker to acetabulum was quite invariable. Together with other features it made a good specific character.

Pharynx large in metacercaria only slightly grew in the definitive host. In 33-day old trematodes it was a little larger than gonads (Fig. 1 d), sometimes equal (Fig. 2 b) but never smaller, partly overlapping one or both suckers.

Caeca seldom extended to the region of oral sucker (Fig. 1 d). They end at a fairly big distance from the posterior body end (Fig. 2 a and 2 b), but in some specimens they were longer (Fig. 1 d).

Gonads spherical. Ovary smaller than testes (Fig. 1 d, Fig. 2 c and 2 d), with few exceptions. Gonads arranged closely to each other; sometimes the ovary was beyond the anterior testis and did not touch the acetabulum (Fig. 1 d).

Cirrus pouch. Large, slim, situated obliquely towards the mid-line (Fig. 1 d and 2 a). At least half of its length beyond the intestinal zone. Generally it extended as far as the region of posterior testis, up to the middle of the latter, sometimes went as far as its posterior end (Fig. 2 b). Usually it occupied over half of the length of the posterior part of the body. The length at least two and a half of the diameter of the largest gonad. The average ratio of the above two dimensions calculated on 30 specimens was 1.5 : 1 and varied 1.1—2.3 : 1. The large cirrus pouch is one of the most typical features of *Leucochloridium subtilis* sp. n. The genital pore was terminal in 10 specimens, subterminal in 17 and dorsal in 4.

Vitellaria. The anterior range of vitellaria almost invariable, generally at the level of mid-line of oral sucker (Fig. 1 d, 2 a, 2 b). The posterior end varied but usually extended far to the end, and they often unite (Fig. 2 d). Sometimes they ended at the level of caeca.

Uterus in most specimens filled the intracaecal space (Fig. 2 a and 2 b), did not cover caeca, but sometimes occupied the region of acetabulum. In some specimens it extended anteriorly farther than the intestinal bifurcation, usually with one elongated loop (Fig. 1 d and 2 d). In 15 of the examined specimens it was completely included in the intracaecal space; in 9 it insignificantly exceeded the intestinal bifurcation, in 12 specimens one loop extended farther than the bifurcation. Relatively small extent of uterus was typical of the examined material, but probably the trematodes were not mature.

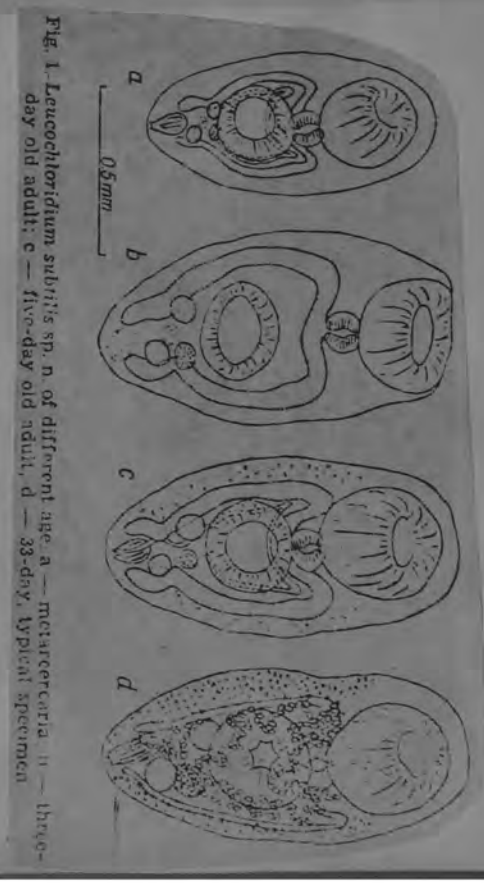


Fig. 1. *Leucochloridium subtilis* sp. n. of different age. a — metacercaria, b — three-day old adult; c — five-day old adult, d — 33-day, typical specimen

Leucochloridium subtilis Pojmanska, 1968

Syn: "sporocyst D" of Pojmanska (1962)

Table II

Dimensions and size ratios of *Leucochloridium subtilis* sp. n. from *Passer domesticus* (L.) (experimental infection)

	Metacercaria	2—day—old	3—day—old	4—day—old	5—day—old	33—day—old
length	0.77—0.87	0.75	0.95	0.78—0.94	0.84—0.96	0.97—1.31
width	0.34—0.46	0.42	0.52	0.46—0.52	0.42—0.48	0.44—0.68
oral sucker	0.20—0.29 × 0.18—0.29	0.25 × 0.26	0.25 × 0.31	0.28—0.36 × 0.28—0.33	0.25—0.30 × 0.25—0.30	0.31—0.41 × 0.26—0.43
pharynx	0.08—0.10 × 0.09—0.11	0.10 × 0.13	0.10 × 0.11	0.10—0.13 × 0.13—0.14	0.09—0.11 × 0.11—0.13	0.09—0.18 × 0.12—0.17
acetabulum	0.16—0.24 × 0.18—0.26	0.22 × 0.23	0.24 × 0.30	0.24—0.25 × 0.25—0.28	0.21—0.28 × 0.22—0.30	0.26—0.40 × 0.27—0.48
testis I	0.04—0.05 × 0.04—0.08	0.04 × 0.04	0.06 × 0.06	0.05—0.07 × 0.07—0.08	0.05—0.10 × 0.05—0.13	0.06—0.12 × 0.08—0.12
ovary	0.04—0.05 × 0.04—0.06	0.03 × 0.04	0.05 × 0.05	0.05 × 0.05	0.04—0.06 × 0.05—0.07	0.05—0.09 × 0.05—0.09
testis II	0.05—0.06 × 0.05—0.06	0.04 × 0.04	0.06 × 0.06	0.07—0.07 × 0.06—0.08	0.06—0.08 × 0.05—0.08	0.06—0.11 × 0.06—0.11
cirrus pouch	0.08—0.09 × 0.04—0.06	0.09 × 0.06	0.11 × 0.08	0.07—0.09 × 0.05—0.07	0.09—0.10 × 0.05—0.07	0.16—0.20 × 0.07—0.09
length to width	1.9—2.3 : 1	1.8 : 1	1.8 : 1	1.6—2 : 1	1.8—2.2 : 1	1.7—2.5 : 1
oral sucker to acetabulum	1—1.2 : 1	1.07 : 1	1 : 1	1.06—1	1.0—1.16 : 1	0.96—1.18 : 1
oral sucker to pharynx	2.2—3 : 1	2.3 : 1	2.6 : 1	2—3.1 : 1	2.4—2.7 : 1	2.2—2.8 : 1
body length to pharynx	7.7—10.2 : 1	6.7 : 1	9 : 1	6.5—7.5 : 1	7.8—9 : 1	7—9.3 : 1
body length to cirrus pouch	8.2—10.3 : 1	8.3 : 1	8.3 : 1	8.7—9.4 : 1	9—10 : 1	5.2—7.4 : 1

Table III

Dimensions and size ratios of *Leucochloridium* sp. from *Squatarola squatarola* (L.) and *Limosa lapponica* (L.) (natural infection)

Host	Length	Width	Oral sucker	Pharynx	Acetabulum	Testis I	Ovary	Testis II	Cirrus pouch	Length to width	Oral sucker to acetabulum	Oral sucker to pharynx	Body length to pharynx	Body length to cirrus pouch
Squatarola squatarola	0.71—1.0	0.31—0.50	0.24—0.32 × 0.24—0.35	0.10—0.12 × 0.10—0.16	0.20—0.31 × 0.18—0.32	0.08—0.15 × 0.09—0.15	0.06—0.10 × 0.07—0.12	0.06—0.13 × 0.08—0.15	0.10—0.16 × 0.05—0.10	1.8—2.5 : 1	1.06—1.3 : 1	2—2.6 : 1	6.1—9 : 1	5.5—9.1 : 1
Limosa lapponica	1.30—1.45	0.65—0.71	0.36—0.44 × 0.38—0.46	0.19 × 0.19	0.35—0.44 × 0.37—0.44	0.09—0.14 × 0.16—0.19	0.10—0.14 × 0.12—0.14	0.15—0.17 × 0.15—0.20	0.17—0.26 × 0.14—0.15	2 : 1	1.02—1.18 : 1	2.4 : 1	6.8 : 1	5.2—7.7 : 1

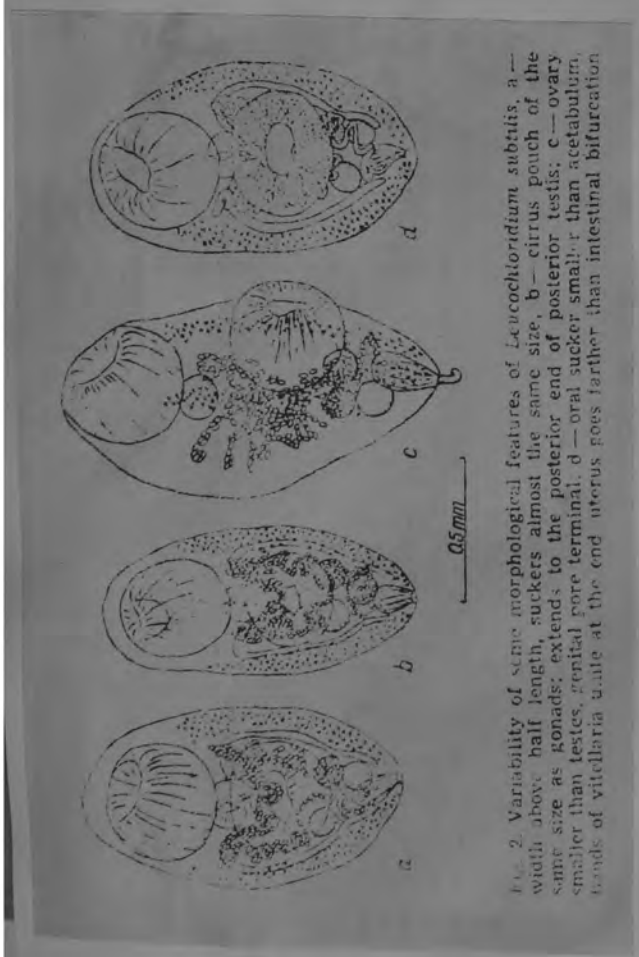
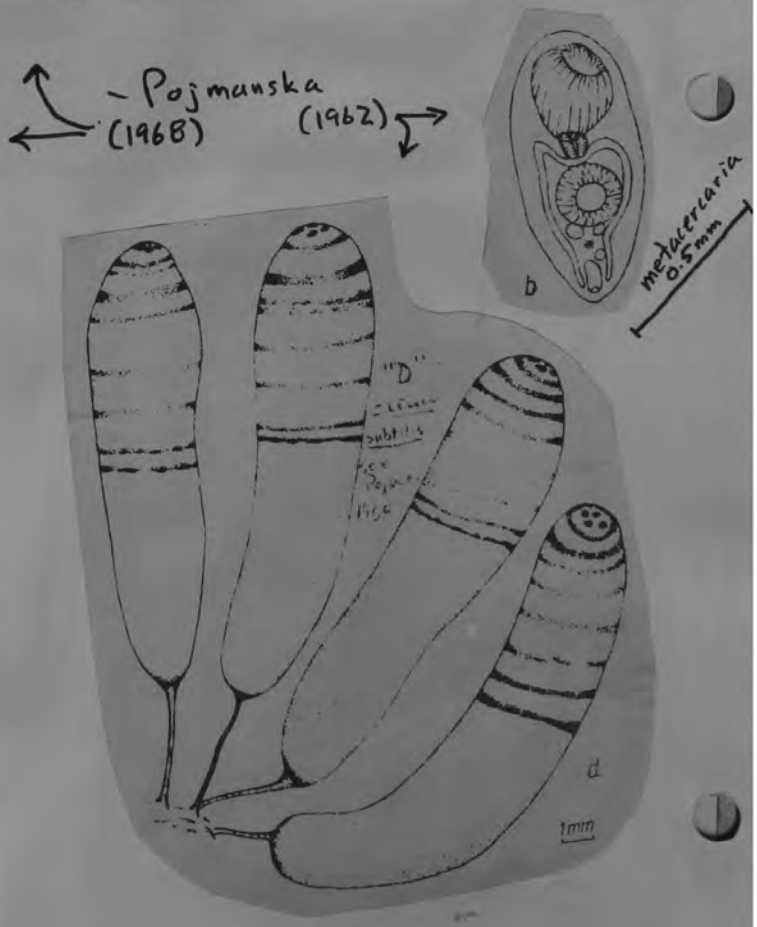


Fig. 2. Variability of some morphological features of *Leucochloridium subtilis*, a — width above half length, suckers almost the same size, b — cirrus pouch of the same size as gonads; extends to the posterior end of posterior testis; c — ovary smaller than testes, genital pore terminal; d — oral sucker smaller than acetabulum, ends of vitellaria quite at the end uterus goes farther than intestinal bifurcation



Leucochloridium sp. — sporocyst D (Fig. 1d)

Found only once in Dziekanów Leśny in ~~September~~ May 1961. The snail contained four big, mature sacks.

Length of sack 15 mm, width 2 mm. Cylindrical shape, fairly slender. Both sack ends bluntly rounded; the proximal end is narrower than the distal one. Thin, delicate, long enough tail. Coloration of sporocyst slightly orange. Fairly vivid colours. Drawing of sporocyst delicate; all coloured rings fairly narrow. Four dark-brown spots on the distal end, slightly protruding on a clear background. On the same background, further on, there are three narrow dark-brown rings (such as the spots). The largest of them is the middle one. The third ring in one of the sacks was divided into two smaller rings. Further on, there are two or three vivid orange rings on a clear background, and next two dark-brown ones near each other. The described part of the sack forms less than a half of its length. The next part is nearly uniformly light-orange, with only slightly marked dark-orange stripes. The proximal sack end is dark-brown and this coloration passes over on a part of the tail.

	length	width	oral sucker	ph.	ventral sucker		testes I	testes II	ovary
Sporocyst d	720-810	360-405	252-270 × 225-243	90-9[illegible] × 99-110	189-216 × 180-234	1:1.09 radio VS:OS	35-50 × 50-52	47-52 × 40-50	30-37 × 35-40

Leucochloridium tetrastae Oliger, 1950

Oliger, I. M. 1952
[Parasite fauna of tetraonid birds of the forest zone of the European part of the RSFSR] [abstract of dissertation] [Russian text]
Trudy Gelmint. Lab., Akad Nauk SSSR 6:411-412.

Leucochloridium variae McIntosh, 1932

syn: L. pricei McIntosh, 1932 (see next page)

Leucochloridium variae n. sp. McIntosh, 1932

Fig. 2.

Specific diagnosis: Body flat, ovate, 1.68 mm. long by 880 μ wide in front of acetabulum. Oral sucker 430 μ by 520 μ, subterminal. Pharynx broader than long, 140 μ by 190 μ. Esophagus very short. Intestinal crura extend into zone of cirrus pouch, the tips approximately 200 μ apart. Acetabulum approximating anterior sucker in size, 430 μ by 450 μ. Reproductive glands about equal in size; anterior testis 100 μ by 135 μ, adjacent to right branch of intestinal crura; posterior testis 100 μ by 115 μ, in contact with left branch of crura. Cirrus pouch 150 μ by 100 μ. Genital pore at posterior end of body, dorsal and subterminal. Ovary 100 μ by 120 μ, located on left side of body in posterior part of zone of anterior testis and directly in front of posterior testis. Fecundarium distinct, 100 μ by 95 μ, situated medial to interval separating ovary and posterior testis, and in line with testes. Vitellaria extracecal, extending from posterior level of cirrus pouch to zone of posterior fourth of anterior sucker. Uterus filled with eggs, confined to intercecal area with exception of short loop on each side of posterior part of anterior sucker. Eggs 25 μ by 16 μ.

[2] Some species of *Leucochloridium*, when stained *in toto*, show very distinctly a more or less spherical mass of cells near the ovary, having about the same staining properties as that organ. On sectioning, this mass of cells was found to be ova contained in a dilated portion of a tube leading from the ovary to Laurer's canal. This structure, designated as "ootype" in a previous paper (McIntosh, 1927), appears to be homologous with the structure commonly designated as the seminal receptacle by authors, and which, on account of its peculiar function as a fertilization chamber, has been given the name "fecundarium" by Sinitsin (1931).

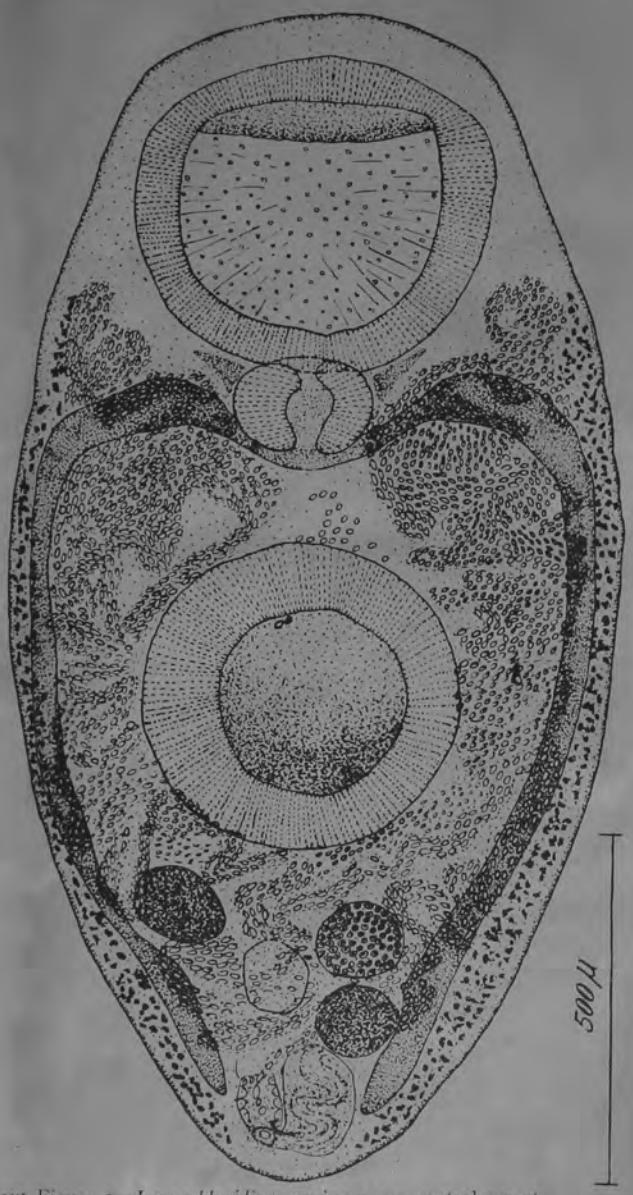
Type specimen.—U. S. Nat. Mus. Helm. Coll. No. 32308.

Host.—*Mniotilta varia* (black-and-white warbler).

Location.—Cloaca.

Locality.—Michigan (Hook Point on Douglas Lake).

The above species differs from *L. mniotiltae*, reported from the same host in Minnesota (McIntosh, 1927), in the general arrangement of the reproductive glands and in the extent of the vitellaria. The vitellaria in *L. mniotiltae* end at some distance anterior to the posterior extremities of the intestinal crura, while in *L. variae* they extend posteriorly beyond the tips of the crura. The arrangement of the reproductive glands in *L. variae* is similar to that in *L. cyanocittae*, but in *L. variae* the glands are much smaller and a well developed fecundarium is present. In *L. variae* the entire zone of the anterior testis is posterior to the zone of the acetabulum, while in *L. cyanocittae*, as well as in *L. mniotiltae*, the anterior testis is located partially in the posterior part of the acetabular zone.



Text Figure 2.—*Leucochloridium variae* n. sp., ventral aspect.

[*Leucochloridium pricei* n. sp. McIntosh, 1932]

= syn. of *Leucochloridium variae* McIntosh, 1932

(previous page)

Fig. 9.

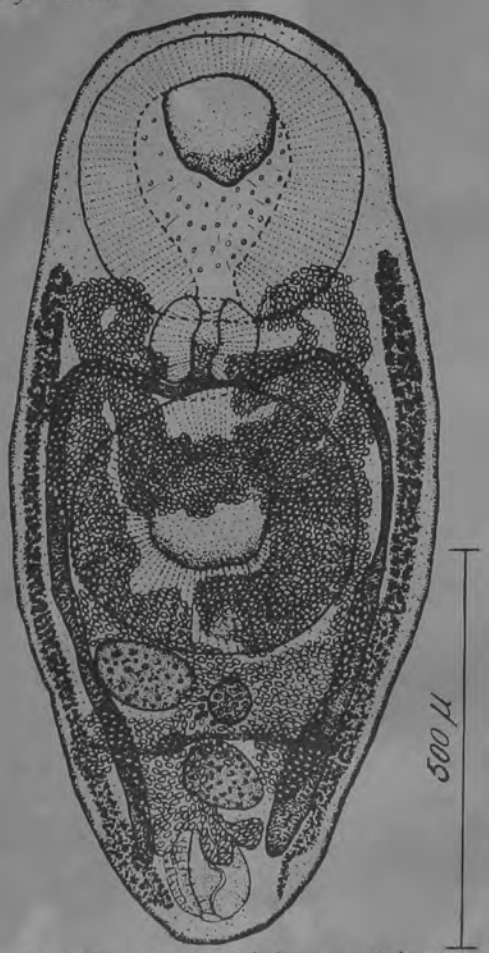
Specific diagnosis: Body ovate, 1.17 mm. long by 540 μ wide in region of acetabulum. Anterior sucker slightly subterminal, 360 μ by 360 μ. Pharynx 120 μ by 140 μ. Esophagus very short. Intestinal crura extend into posterior end of body to area of cirrus pouch, the tips approximately 140 μ apart. Acetabulum 340 μ by 360 μ, situated near equator of body. Anterior testis transversely oval, 80 μ by 130 μ; posterior testis 80 μ by 105 μ. Cirrus pouch 140 μ by 80 μ; cirrus short, globular. Genital pore at posterior end of body, dorsal and subterminal. Ovary spherical, 60 μ in diameter, situated near median line of body directly in front of posterior testis and occupying a part of the zone of the anterior testis. Fecundarium indistinct. Vitellaria extracecal, beginning near the level of the posterior margin of the anterior sucker and ending at or near the tips of the intestinal crura. Uterus filled with eggs, occupying most of intercecal area and area lateral to the pharynx. Eggs 23 μ by 17 μ.

Type specimen.—U. S. Nat. Mus. Helm. Coll. No. 32404.

Host.—*Canachites canadensis osgoodi* (Alaska spruce grouse).

Location.—Intestine.

Locality.—Alaska.



Text Figure 9.—*Leucochloridium pricei* n. sp. ventral aspect.

The above species with the reproductive glands arranged in a triangle, and with the very small ovary situated near the median line of the body, is regarded as distinct from the other North American species.

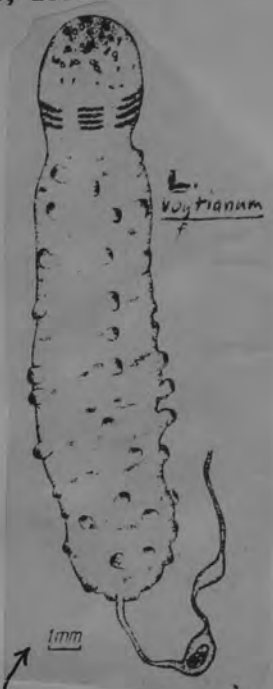
Leucochloridium vogtianum Baudon, 1881

Leucochloridium vogtianum Baudon, 1881 (Fig. 1f)

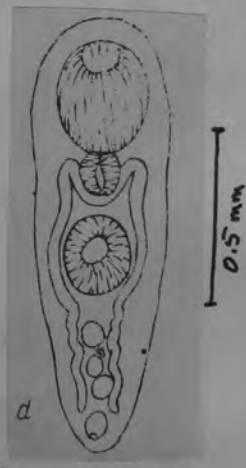
Described for the first time by Baudon, France, from the snail *Succinea baudoni*. The description of the sporocyst is rather spare, but the drawing is very good. The same sporocyst was found by Ginecinskaia 1954 at the Volga estuary in seven specimens of *Succinea elegans*, and described as a till now unknown papillar sporocyst.

I found it twice in Białowieża in August 1958. In one case, there were in the snail two mature sacks, in the second case one mature and two young sacks. The specimens were very similar to Baudon's drawing, but differed slightly in their shape from the drawing of Ginecinskaia. They seem to be bigger and more slender, but there is no doubt that they are of the same species, because of the characteristic papillae on the surface of the sack and because of the drawing and coloration of the „cap". They reach 20 mm in length (Baudon gives 13 mm) and are therefore the biggest sporocysts ever found by the present writer. Also the larvae are very big (dimensions in Table I), slender, narrowing towards the rear end of the body (Fig. 2c). The ventral sucker, smaller than the oral one, lies at the middle of the body length. Big pharynx; intestines terminate on the level of the front edge of the cirrus pouch. The genital glands lie in one line, distinctly shifted from the ventral sucker. Only in one of the preserved specimens a slight shift of the front testis to the right was stated. Such an arrangement of genital glands does not correspond to the data of Ginecinskaia, who describes them as situated in a triangle. The ovarium is always smaller than the testes. „Round body" lies just in front of ovarium, sometimes overlapping it slightly. Small cirrus pouch.

	Length	Width	O.S.	Ph.	V.S.		Tester I	Tester II	Ovary
L. vogtianum	1,040-1,200	340-380	270-315 × 243-270	99-108 × 108-126	198-234 × 189-225	1:1.32 ↑ ratio of VS:OS	50-75 × 50-85	50-70 × 50-65	45-50 × 42-50



Pojmanska (1962)



-Pojmanska (1962)

-original text of Baudon (1881) on reverse:

Baudon
(1881)
pp: 145-147

A cette saison, j'ai trouvé, sur une S. Baudoni qui avait atteint des dimensions gigantesques, par rapport à l'espèce, un Leucochloridium, dont je vais donner la description. L'animal et sa coquille avaient acquis des proportions insolites, parce qu'il logeait un hôte qui l'obligeait à grossir malgré lui, afin de lui faire place. Cet exemplaire exceptionnel portait une mâchoire semblable à celle du type et la spire était bien plus allongée que d'ordinaire.

Le parasite dont il est question occupait le tentacule gauche. Il ressemble au L. paradoxum par son mode d'habitation et paraît avoir des habitudes conformes, mais les caractères diffèrent. Ainsi, d'un filament très ténu d'abord et augmentant progressivement, logé dans le foie, sort un gros sac allongé, de 13 millimètres, mou, blanchâtre, divisé par des segments très écartés qu'indique à peine une saillie circulaire effacée, et portant latéralement des tubercules peu proéminents. Ils sont marqués par un point roussâtre, situé à leur sommet. Les lignes de démarcation des segments deviennent plus apparentes quand l'animal est exposé à l'air pendant quelques minutes. Le sac contient une quantité de cercaires, puis il se rétrécit et se termine par une sorte de renflement entouré de taches régulières, isolées, de raies d'un brun clair disposées symétriquement. Enfin, l'extrémité antérieure brune, subaiguë, montre au centre deux éminences saillantes, séparées par un enfoncement. D'après le dessin exécuté sur nature, on croirait voir un scolex de Tænia, parce que je l'ai figuré pendant le mouvement de rétraction.

En présence de ce parasite, que je rencontrais pour la première fois, je m'empressai d'envoyer au savant C. Vogt description et dessin. Ce Leucochloridium lui est inconnu. Il pense avec raison qu'il faudrait rassembler un certain nombre d'observations avant d'être fixé. N'ayant à ma disposition que cet unique individu, il m'est impossible de fournir de plus amples détails. Je n'hésite pas cependant à le signaler, et, si de nouvelles études pouvaient autoriser la création d'une espèce, je lui donnerais le nom de Leucochloridium Vogtianum (Pl. V, fig. 5).

Si chaque type de Succinée nourrissait un parasite spécial, le fait serait curieux, mais c'est une conjecture que des découvertes ultérieures peuvent seules confirmer. Les espèces d'Ambrettes les plus hydrophyles m'ont seules, jusqu'ici, présenté des parasites. S. arenaria, S. humilis, S. oblonga, souvent éloignées des fossés ou cours d'eau, ne m'ont jamais offert de Leucochloridium. Ceci peut s'expliquer jusqu'à un certain point, mais je ne nie pas, du reste, qu'elles ne puissent en renfermer.

From Fischthal and Kuntz, 1973

Leucochloridium sp. (Fig. 4)

HOST: *Anthus gustavi gustavi* Swinhoe, wagtail (Passeriformes: Motacillidae).

HABITAT: Small intestine.

LOCALITY: Tarabanan Concepción.

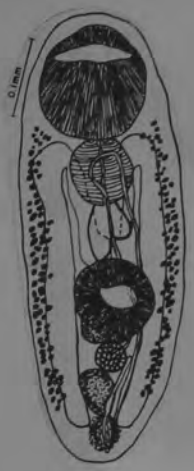
DATE: 14 May 1962.

SPECIMENS DEPOSITED: No. 72168.

DESCRIPTION (based on 10 immature worms, four measured): Body elongate oval, widest just preacetabular, extremities rounded, tegument spined, 430–580 long by 182–285 wide. Forebody 222–295 long; hindbody 111–162 long; forebody–hindbody length ratio 1:0.49–0.56. Oral sucker subterminal ventral, slightly longitudinally elongate, 143–172 by 136–160; preoral space 10–24 long; acetabulum round to slightly longitudinally or transversely elongate, postequatorial, filling intercecal space, 97–123 by 92–121, center at anterior 61–64% of body length; sucker length ratio 1:0.68–0.76, width ratio 1:0.68–0.78. Prepharynx very short, often not apparent; pharynx not overlapping oral sucker, round to slightly longitudinally elongate, 75–92 by 65–90; esophagus thick-walled, very short, opening into thick-walled prececal sac; ceca thick-walled, passing dorsally and then anteriorly to sides of posterior part of oral sucker before looping posteriorly, extending posttesticularly to within 24–44 of posterior extremity.

Gonads smooth, usually longitudinally elongate but occasionally transversely elongate, contiguous to overlapping one another, tending to go from dorsal (anterior testis) to middepth (ovary) to ventral (posterior testis) position, usually with anterior testis sinistral and with ovary and posterior testis median to mediodextral and tandem to diagonal, sometimes all three tandem or with anterior testis dextral, in two worms ovary entirely posttesticular in position normally occupied by posterior testis. Anterior testis overlapping acetabulum dorsally, 52–66 by 41–75; posterior testis 53–69 by 44–69; posttesticular space 34–73 long. Seminal vesicle sinuous, walls appearing thick and cellular; pars prostatica elongate oval, narrowing to short duct before entering elongate oval, posttesticular cirrus sac, both structures surrounded by gland cells; cirrus smooth, unspined. Genital pore median to slightly submedian, ventral, very near posterior extremity. Ovary 39–48 by 34–53. Vitellaria in lateral fields, extending from posterior part of oral sucker to posterior testis level, terminating 76–97 from posterior extremity, well anterior to cecal ends, follicles only ventral and ventrolateral to ceca. Uterus only with single sinuous ascending and descending limbs extending anteriorly to pharynx, passing dorsal to acetabulum; metraterm thick-walled, longer than and sinistral to cirrus sac.

DISCUSSION: The present form differs from *L. palawanense* in having an unspined cirrus and the cirrus sac lying entirely posttesticular, and from *L. philippinense*, *L. dasylophi*, and *L. hypotaenidiarum* in having the acetabulum considerably smaller than the oral sucker. Because the coiling of the uterus and the body proportions are not fully developed, the worms cannot be identified.



Leucochloridium sp. Ingram & Hewitt, 1942

(* = Ithaca sporocyst of I. & H.)

THE ITHACA SPOROCYST

The green, white and dark brown mature sporocyst branch was situated in the right tentacle of *Succinea*. When brought into the laboratory, the pulsating action of this sporocyst was vigorous, often causing it to contract completely out of the tentacle into the haemocoel, out of sight of the observer. After such violent contraction took place the branch always regained its position in the right tentacle, never erring and entering the cavity of the left tentacle, or being trapped in the haemocoel. The pulsations only took place when the branch was kept away from direct light. When the rays from a 60 watt bulb were thrown on the snail the branch became less active in its pulsations and eventually contracted out of the tentacle. When the direct light was removed the pulsating movements were resumed. When the branch was completely retracted, it was noted that the right tentacle had been permanently stretched until it was about twice the size of the left one.

The mature sporocyst branch was removed and placed in normal saline solution. In the solution it began to discharge metacercaria from two holes caused by injury in removing it from the body of the snail. The metacercaria were popped out with such force that they were sent from 10 to 15 mm. away from the sporocyst branch.

Measurements of the sporocyst branch were taken after it had been preserved in three percent formaldehyde; it was 14 mm. in length and 2 mm. broad. The color of the mature sporocyst branch was most varied. The extreme distal end was light brown with three wart-like protuberances colored deep reddish brown arranged around the center of the distal end. This zone was .25 mm. wide. The next color band, 2 mm. wide, was yellow-green flecked with white and red-brown spots which overlapped one another. Next was a zone of unspotted green about 1.25 mm. wide. This zone was followed by a band 1 mm. in width which had a white background with irregular green spots in an unorderly circlet. The most proximal band was 2 mm. in width with irregular longitudinally arranged streaks of red and white alternating with one another. The remaining portion of the sporocyst branch and its stalk were white in color.

-*Leucochloridium* sp. Ingram & Hewitt, 1942
(= "Rensselaerville sporocyst")
syn. of *L. fuscostriatum* Robinson, 1948

-see: *L. fuscostriatum* Robinson, 1948

Leucochloridium sp. Pojmanska, 1962

syn: "sporocyst A" of Pojmanska (1962)

Leucochloridium sp. — sporocyst A (Fig. 1a)

Found only once in Dziekanów in August 1960. The snail contained one mature sack. It was 10 mm long and 2 mm wide. Cylindrical shape. The proximal end of the sack, bluntly rounded, passes into a filiform part, which joins it with the body of the sporocyst, and has a quite thick base narrowing violently further on. The distal end is narrower than the proximal one. The whitish sporocyst is provided with brown, orange and yellow rings. The colours are dull, grayish. Very characteristic is the occurrence of distinct coloured rings on the whole length of the sack. The arrangement of the rings is as follows: distal tip dark-brown, white ring, dark-brown ring, wide white ring, three narrow orange rings separated from each other by slightly wider white ring, wide white stripe, three wide brown rings (slightly clearer than the tip) separated by narrower white rings. These rings occupy about the half length of the sporocyst sack. Further on there occur alternately large white and narrow yellow stripes. The yellow rings become darker towards the proximal end. On the tail base there occur dark, brown spots similar in colour to the second series of brown rings. The sack contained over 100 metacercariae.

The described sporocyst resembles slightly *L. problematicum* Magath, 1920 (described also by Woodhead 1935 as red-brown sporocyst, by McIntosh 1943, Kagan 1951 and Ginecinskaia 1954) and *L. fusco-striatum* Robinson, 1947, but the arrangement of the coloured rings is slightly different. There are also lacking the small, dark spots on the proximal part of the sack described in *L. problematicum*.

Table I

Measurements of metacercariae from various sporocysts of the genus Leucochloridium

Sporocyst	Length	Width	Oral sucker	Pharynx	Ventral sucker	Ventral to oral sucker	Testis I	Testis II	Ovary
Sporocyst a	495-711	243-355	162-207 × 162-198	63-90 × 72-99	153-171 × 171-189	1:1.06	27-52 × 32-55	32-45 × 30-42	27-40 × 30-40

Leucochloridium sp. Pojmanska, 1962

syn: "sporocyst B" of Pojmanska, (1962)

Leucochloridium sp. — cporocyst B (Fig. 1b)

Found only once in Dziekanów Leśny in August 1960. The snail contained two coloured sacks.

Length of sack about 5 mm, width of its front part about 1 mm. This sporocyst is therefore much smaller than the former. It is one of the smallest sporocysts ever found by the author. A club-like shape, narrowing towards the proximal end. This end passes into a tail, at first quite wide, but gradually becoming narrow. The orange coloration of the sack is very characteristic. Brown rings appear on an orange background. Intensive colours. An orange-brown „cap" with a few big enough, slightly protruding, dark spots, occurs on the distal end, distinctly differentiated from the rest of the sack. A dark-brown point lies on each spot. Behind the „cap", there are two orange-brown rings (the same colour as the „cap") and two dark-brown rings (the same colour as the spots on the „cap"), on an orange background. These rings occupy less then the half of the sack length. Further on appear, on the orange background, narrow, darker rings (the same colour as the „cup" background). Two dark-brown rings separated by three clearer ones lie on the proximal end of the sack which passes into the tail. The remaining part of the tail is yellow-orange.

The orange sporocyst described by Ginecinskaia 1954 has a quite different drawing.

(Leucochloridium sp. Rao, 1925)

-described as abnormal genitalia of an Indian succineid

In the only other adult specimen in the collection a curious abnormality of the genitalia was observed. A pair of long cylindrical thin-walled tubes tapering gradually towards their distal extremity was found in the position occupied by the genitalia in the normal specimen. Their external openings were narrow and placed close together. A little way from the external opening of one tube an elongated sac with a narrow neck joined it, while in the other a fan-shaped structure with finger-like processes. The free extremity of the tubes had reddish-brown spots arranged more or less in a concentric manner, while a little below was found a regularly interrupted broad band of the same colour round the tube. How the genitalia came to be modified in the manner described is difficult to say, but it is clear from the position of the structures in the animal in which no trace of the genitalia was found, that they represent the latter and have undergone modification as a result, apparently, of parasitisation by some organism.

Type-specimen.— M $\frac{2514}{2}$ Zool. Surv. Ind. (*Ind. Mus.*).

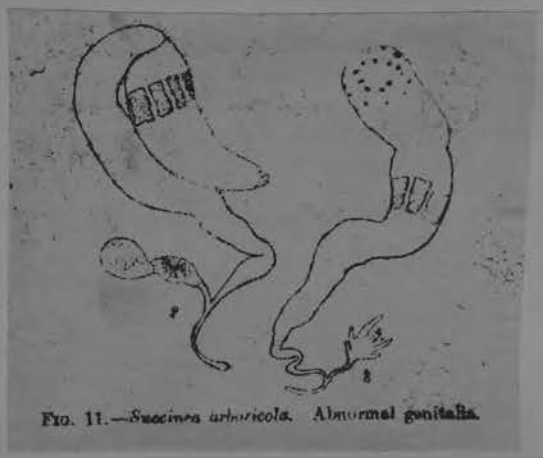


FIG. 11.—*Succinea arboricola*. Abnormal genitalia.

Leucochloridium sp. from Witenberg, 1926

Fig. 9.
L. sp. from
Muscicapa grisola

LEUCOCHLORIDIUM

PEN-TAB

LOOSE LEAF INDEX

SCHEDULE

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Dollfusinus Biocca et Ferretti, 1958

Generic diagnosis: Leucochloridiidae. Leucochloridiinae. Body elongated oval, aspinose. Oral sucker subterminal, rounded; prepharynx and esophagus very short, latter may be practically absent; pharynx muscular; ceca somewhat winding anteriorly, terminating at posterior extremity. Acetabulum subequal to oral sucker, in anterior half of body. Testes diagonal, in posterior half of body. Cirrus pouch small, at posterior extremity, cirrus protrusible. Genital pore at extreme posterior end of body. Ovary round, submedian, posterolateral to anterior testis. Laurer's canal opening outside dorsal to posterior testis. Uterus occupying most of intercecal field, reaching further forward than acetabulum; metraterm well differentiated; eggs small. Vitellaria extending nearly throughout extracecal fields of hindbody, leaving posterior region free. Excretory vesicle Y-shaped. Parasitic in paranasal sinus of mammals.

Type species: *D. frontalis* Biocca et Ferretti, 1958 (Fig. 1577) in *Erinaceus europaeus*, Italy. 3.25-4.6 × 1.15-1.8 (27-30 ×, 16-19). 4.6 × 1.6 (28.5 × 18.5)–Timon-David (1965).

In *Helicella* (*Helicopsis*) *arenosa*, sac-like sporocyts with two marginal cylindrical diverticles were produced 46 days after ingestion of eggs; 82-day-old sporocysts 2.5mm long contained numerous cercariae even in the diverticles; first cercariae appeared at 67 days, and some were fully developed at 82 days, with four excretory canals leading into bladder and a short stumpy tail.

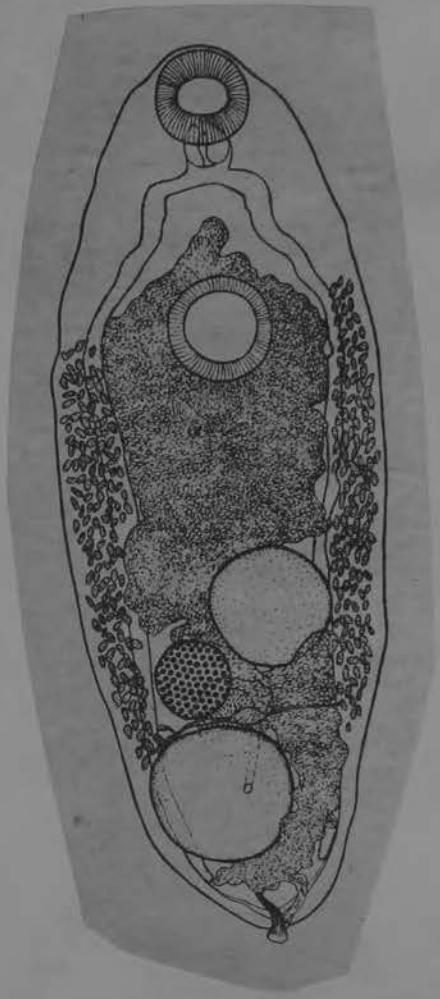
Cercariae were shed when the snails were placed in a humid atmosphere. A second intermediary is not yet determined, but probably the same snail species is required for completion of the life cycle–Timon-David (1964). 2 sporocyst generations were found, and *Euparypha pisana* were exper. infected with the cercariae, which, however, do not encyst in this second intermediary. Entire life cycle similar to that of *Postharmostomum helicics* and *P. commutatum*–Timon-David (1965).

–Yamaguti (1971)

GENUS DOLLFUSINUS BIOCCA & FERRETTI, 1958

(Leucochloridiinae)

Dollfusinus frontalis Biocca & Ferretti, 1958(b)
in: Erinaceus europaeus, frontal nasal sinus,
Italy; see also Ferretti & Cortini(1959a)



DOLLFUSINUS

GENUS NEOLEUCOCHLORIDIUM KAGAN, 1951

(Leucochloridiinae)

Generic diagnosis from Kagan (1952):

Leucochloridiinae: Distomes elongate, rounded at both ends. Suckers large and well developed. Cuticle spinose or aspinose. Prepharynx small, pharynx large, intestinal ceca reaching to hind end of body. Excretory pore dorsal. Excretory bladder simple, muscular. Uterus intracecal, circling acetabulum in short loops, opening subterminally; metraterm muscular; terminal portion of uterus richly endowed with gland cells. Genital pore subterminal. Cirrus pouch large, muscular, well developed. Cirrus long, smooth, pustulated. Testes and ovary in triangular position. Receptaculum seminis present. Laurer's canal long, ~~in~~ opening into excretory bladder. Vitellaria well developed, extracecal. Parasites in digestive tract of bird. Type species: Neoleucochloridium problematicum (Magath, 1920) Kagan, 1951.

Genus *Neoleucochloridium* ~~gen. nov.~~ KAGAN, 1951

Generic diagnosis: Leucochloridiinae: Distomes elongate, rounded at ›oth ends. Suckers large and well developed. Cuticle spinose or aspinose. Prepharynx small, pharynx large, intestinal caeca reaching to hind end of ›ody. Excretory pore, dorsal. Excretory bladder simple, muscular. Uterus intracaecal, circling the acetabulum in short loops, opening sub-:erminally; metraterm muscular; terminal portion of uterus richly endowed with gland cells. Genital pore subterminal. Cirrus pouch large, muscular, well developed. Cirrus long, smooth, pustulated. Testes and ovary in :riangular position. Receptaculum seminis present. Laurer's canal long, ›pening into excretory bladder. Vitellaria well developed, extracaecal. Parasites in digestive tract of birds.

Type species: Neoleucochloridium problematicum (Magath, 1920) new :omb.

The description of the sporocyst was made from two mature sporocysts which were essentially alike in all respects. The sporocyst of this species is 1.4 cm. long by 0.33 cm. wide and pointed at both ends. The proximal end is continued in a thread-like tube which a little distance away has in its course a small fusiform swelling. The tube then continues into the liver of the snail where many small knob-like projections appear in the hepatic tissue and are connected by thread-like processes. The wall of the sporocyst is rather thick and tough, being 6μ thick. It is white and translucent. The distal half of the sporocyst is banded with deep golden red bands which show very accurately in figure A (Plate). Some of these are darker than others and the lighter ones tend to be more yellow. No bands appear beyond the distal half. The proximal ¼ is flecked with bronze spots, minute in size, but readily seen. These flecks are also present for a short distance on the tube projection. By comparison with the sporocyst of *L. macrostomum*, it will be seen that this sporocyst is essentially different in marking and color. They are both near the same size.

A cross section of the wall of the sporocyst is seen in figure 14. It is made up of an outer longitudinal layer and an inner circular layer of muscles; the former becomes divided by diagonal fibers which serve to break them up into bundles. The nuclei are irregular and branching. Pigment is present in the cells beneath the outer layer. The sporocyst is capable of pulsation, when mature projects from the snail's tentacle, and each contains about 100 larvae which are very active when freed in water; each has a little sac covering it which is quite transparent and has connections with the two suckers. The sac in the living material was 2.6 mm. by 1.4 mm.

The larvae themselves are about 2.2 mm. long and 0.85 mm. wide. They are quite active and very transparent. The cuticula is beset with fine cilia and some of the organ systems are best studied from living material. This form has two well developed suckers which are readily seen with a low power lens. The oral sucker is the larger of the two, and has its opening near the anterior end of the body. This sucker is 0.24 mm. wide and 0.4 mm. deep. Its posterior end leads into a rather powerful muscular pharynx which is 0.17 mm. by 1.15 mm. From this the lateral intestinal crura arise and each one passes down on either side of the worm to the level of the opening of the excretory canal. These crura are not especially narrow as in *L. macrostomum*, but are in *L. problematicum* 0.55 mm. in diameter. The ventral sucker is 0.34 mm. in cross section, is circular and situated about in the middle of the antero-posterior axis.

The excretory system is not unlike that of *L. macrostomum*, and consists of a rather simple set of tubules. The flame cells are situated throughout the body and seemed to be collected in a larger pair of tubules, one right and one left. These pass down in the body parenchyma on the ventral side of and median to the intestinal crurae to within 0.10 mm. of the end of the crura. Making a rather sharp turn each tubule, expanding in diameter, passes anteriorly and laterally to the crura to within 0.2 mm. of the anterior tip of the body. Another sharp turn here occurs and with increasing diameter each tubule passes posteriorly between the ascending ramus and its corresponding one of the intestinal crura gradually towards the mid line, where it joins its fellow, after a slight fusiform enlargement, in the mid line 0.09 mm. from the posterior tip on the dorsal side of the body. Almost immediately the excretory pore opens to the exterior. These posterior enlargements of the descending rami are pulsating in character, filling and emptying every few seconds.

The genital organs are quite well developed in these larvae and one has no difficulty in outlining them, as they are certain to occur in the adult. The testes are two in number, one anterior lying to the right of the mid line, the other posterior, 0.13 mm. behind the former and to the left of the mid line. There passes from each and towards the other a small duct, the two joining 0.03 mm. from the posterior testis; from this union there arises a small duct which passes posteriorly, slightly to the right of the mid line, through the cirrus sac and opens as the ductus ejaculatorius to the exterior 0.58 mm. from the posterior tip in common with the uterus. The cirrus sac is fusiform, tapering more sharply anteriorly and is 0.16 mm. by 0.07 mm. No cirrus is developed in this stage of the larvae.

The ovary is spherical in shape; 0.052 mm. in diameter and lies on the left side of the body, at a level between the two testes and nearer the posterior one. There passes from it towards the mid line a short oviduct which almost immediately is joined by Laurer's canal. This canal passes posteriorly and ends in the excretory duct immediately before it opens to the exterior, just as described in the case of *L. insignis* by Looss. The oviduct after a short bend receives the two ducts from the embryonic yolk glands. Following this the oviduct makes a twist upon itself and then passes anteriorly as the ascending uterine branch, first in the mid line, then to the left of the ventral sucker. This branch turns toward the mid line anterior to the sucker and passes posteriorly to the right, then in the mid line and by a more or less straight course to the genital pore on the dorsal surface of the body.

The oviduct receives the yolk gland ducts, which are in reality the shell glands, and makes a coil within an organ called the "round body." This is perhaps a gland which acts in some way upon the shell gland substance, perhaps as a precipitin, and was noted in the larva of *L. macrostomum*, but not in the adult.

Several unicellular glands are found just posterior to the ventral sucker and also along the anterior margin of the oral sucker. Their function is one of speculation, and no data is at hand to make even a profitable explanation for their presence.

[TYPE SPECIES]

Neoleucochloridium

problematicum (Magath, 1920) Kagan, 1952

syn: L. problematicum Magath, 1920

(see next pages)

	L. macrostomum Larva	L. macrostomum Adult	L. problematicum Larva	L. insignis Adult	L. cercatum Adult
Length	0.8	1.8	2.2	3.0	4.0
Width	0.45	0.9	0.85	1.35	1.2
Anterior sucker	0.17	0.20	0.39	0.73	0.60
Ventral sucker	0.14	0.20	0.34	0.69	0.72
Width pharynx	0.075	0.16	0.15	0.30	0.22
Testes					
Anterior	0.058	0.20	0.074	0.22	0.26
Posterior	0.060	0.22	0.061	0.20	0.26
Ovary	0.059	0.20	0.052	0.13	0.24
Cirrus sac	0.061 by 0.061	0.15 by 0.16	0.07 by 0.16	0.13 by 0.33	0.13 by 0.34
Round body	0.041		0.043		
Larval sac	1.1 by 0.8		2.6 by 1.3		
Sporocyst	1.7 by 0.25 cm.		1.3 by 0.3 cm.		

All measurements in millimeters.

Magath (1920)

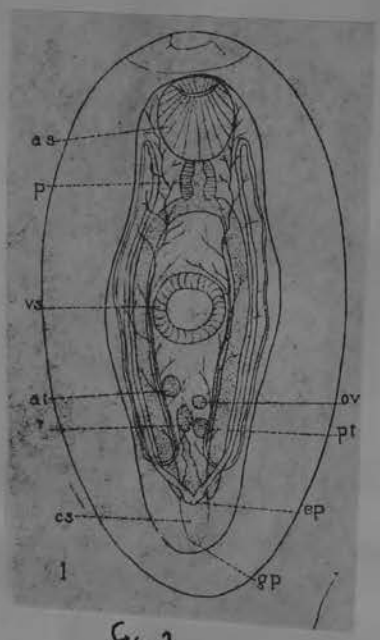


fig. 1

fig. 13

N. problematicum (continued)

-See also previous pages (2)

Neoleucochloridium problematicum (Magath, 1920) ~~new comb.~~ KAGAN, 1951

Specific diagnosis: Neoleucochloridium: Body elongate, flattened ventrally arched dorsally; length 3.209 mm, width 1.381 mm. Cuticle spinose only on ventral surface. Oral sucker, subterminal, 0.740 mm long by 0.779 mm wide. Acetabulum pre-equatorial, slightly smaller than oral sucker, 0.727 mm long by 0.743 mm wide. Pharynx, muscular, 0.223 mm long by 0.274 mm wide. Oesophagus extremely short. Intestinal caeca narrow and tubular, curving anteriad at level of pharynx and terminating in area of cirrus pouch. Genital pore dorsal and subterminal. Cirrus sac large, muscular, 0.372 mm long by 0.199 mm wide. Pars musculosa, muscular. Cirrus long, pustulated and unarmed. Testes, entire, ovoid; anterior testis, dextral, 0.188 mm long by 0.269 mm wide; posterior testis, sinistral, 0.251 mm long by 0.323 mm wide. Ovary ovoidal, located one side of mid-line in front of and proximate to posterior testis, 0.193 mm long by 0.239 mm wide. Mehlis' gland well developed. Laurer's canal opening into excretory bladder. Receptaculum seminis present. Uterus sinuous, intracaecal. Metraterm, muscular. Vitellaria, extracaecal, extending posteriad to area of cirrus sac. Eggs, 0.024 mm long by 0.016 mm wide.

14

Hosts: ***Porzana carolina, Fulica americana, Gallinula Chloropus;*** (experimental) ***Rallus limicola*** and ***Gallus domesticus.***

Habitat: Cloaca, (bursa Fabricii of experimental chick).

Locality: Washington, D. C., Minnesota and Michigan and probably elsewhere in the continental U.S.A.

DESCRIPTION OF THE ADULT

Since the original characterization of the species was based on specimens recovered from a Sora Rail, *N. problematicum* (Magath) is recharacterized from nine specimens recovered from another Sora Rail by McIntosh in 1935.

Digestive system: The oral sucker is very muscular and subterminally located. The prepharynx is very short and the pharynx very muscular with both pharyngeal and oesophageal glands. Oesophagus very short, seen only in sections. Intestinal caeca are thin and, characteristically, curve anteriad in the area of the pharynx and then turn backward, terminating in the posterior end of the body. The caeca are lined with elongate epithelial cells whose Nuclei are compressed in a narrow band near the basement membrane, and the cytoplasmic area is transparent but fibrous, giving the caeca the appearance of being ciliated. When distomes were removed from the host, blood was not observed in the caeca, differing in this respect from *Postharmostomum helicis* (subfamily Brachylaeminae).

Excretory system: The excretory bladder is narrow and slightly Y-shaped anteriorly. Laurer's canal opens on the dorsal surface just below the fork in the bladder. From the bladder the main excretory tubes extend to the side of the body and forward as far as the level of the pharynx, where they recurve and extend back to the level of the posterior testis, then bend forward again extending to the level of the acetabulum where the large excretory duct becomes subdivided into many secondary and these into tertiary tubules ramifying throughout the body. The excretory tubes are unciliated. The excretory pore opens on the dorsal surface very close to the genital pore.

Male reproductive system: The two testes are diagonally situated in the posterior part of the body, and are ovoid and entire in relaxed specimens. In specimens fixed under coverglass pressure testes are slightly lobate. From the terminal margin of the anterior testis and the posterodorsal margin of the posterior testis the thin-walled vasa efferentia distended with spermatozoa unite in the region below the Mehlis' gland to form the vas deferens. Between the posterior testis and the cirrus sac the vas deferens enlarges into a long narrow muscular pars musculosa (Fig. 3). The cirrus pouch is muscular and the prostate cells lie external to it. The cirrus is smooth and covered with many large pustules (Fig. 7) that are not cuticular formations but an integral part of the cirrus.

Female reproductive system: The ovary is situated in front of the posterior testis to one side of the mid-line. The oviduct (Fig. 5) is short and joined by a duct from the receptaculum seminis; making a turn within the Mehlis' gland it is joined by the common vitelline duct before enlarging into the ootype. Mehlis' gland cells are numerous and elongate. Laurer's canal is thick-walled, muscular, taking its origin from the base of the

-OVER-

receptaculum seminis and terminating in the excretory bladder (Fig. 3). Vitelline cells were frequently seen in Laurer's canal. The uterus may be differentiated into four regions. Passing anteriad from the ootype, the uterus is thin-walled and functions as a receptaculum uterinum as well as a passageway for developing eggs. The main portion of the uterus is thin-walled, filling the intracaecal space and passing across the body between the pharynx and acetabulum. In the region between the posterior testis and the cirrus sac, the wall of the uterus becomes slightly muscular and surrounded by many gland cells (Fig. 3). The metraterm is approximately three fourths as long as the cirrus, muscular, and lined with cuticle. Vitelline follicles are extracaecal and extend posteriad to the area of the cirrus pouch.

Witenberg believed that the gland cells surrounding the uterus in the area of the cirrus pouch were "Kittdrüsen," i.e., collateral glands or cement glands. I have not been able to ascribe a function to them.

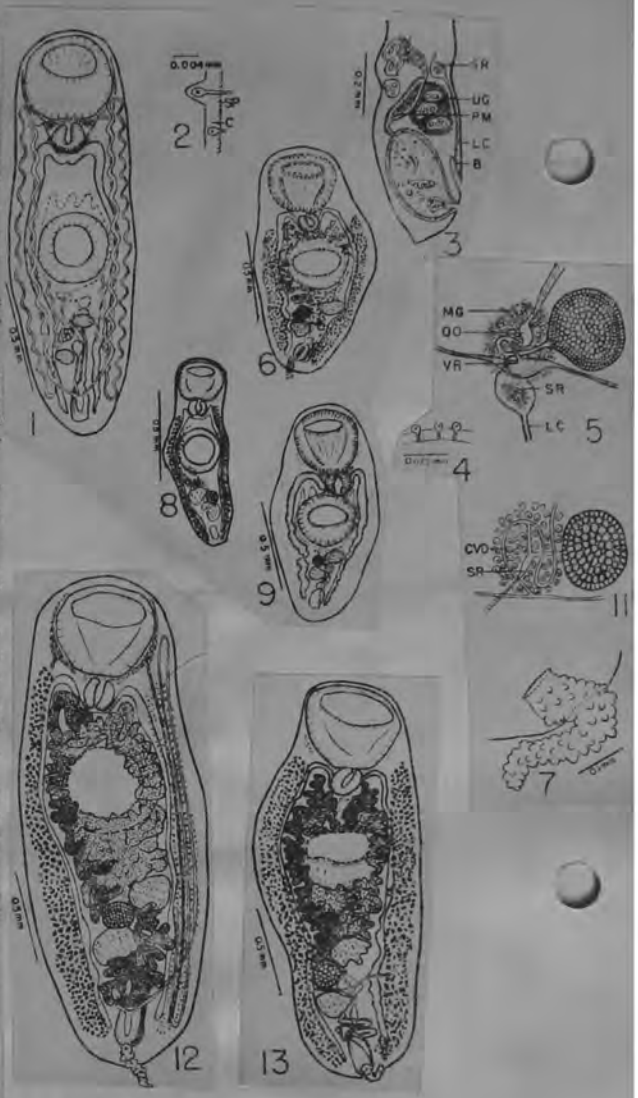
Nervous system: In whole mounts stained with alcoholic cochineal two large ganglia were observed lying beside the oral sucker with processes extending around the anterior and posterior rim of the acetabulum and two main trunks extending posteriad in the body (Fig. 12). Smaller connections to the organs were not seen.

Integument: The cuticle is spinose only in the region of the oral sucker and on the ventral surface. The dorsal surface is covered with sensory papillae (Fig. 4) which are concentrated in the region of the genital pore. Many simple glands are located in the parenchyma beneath the cuticle. *N. problematicum* is the only species in the genus that has been reported as spinose.

Feeding experiments: Feeding experiments with red-brown sporocysts were conducted with a total of 56 birds and two mice. Positive results were obtained with one Sora Rail, one Virginia Rail, seven Gallinules, five Coots and five chicks. Negative results were obtained with eight English Sparrows, 12 chicks, one Song Sparrow, one Field Sparrow, one Robin, one Horned Lark, one pigeon, two Mourning Doves, five Red Wing Blackbirds, one canary, two ducks and two mice.

In the experiments with passerine birds, young nestling birds were used and in many instances were fed large numbers of metacercariae. Another unsuccessful method of exposure was with metacercariae placed in artificial gastric juice until the mucoid capsule surrounding them was dissolved away and then the metacercariae were introduced directly into the cloaca by the mud drop method. Negative results in 18 experiments with seven species of passerine birds suggests that host specificity may exist for species of *Neoleucochloridium*.

The natural hosts for *N. problematicum* in Michigan are birds of the family Rallidae. The 11 birds raised in the laboratory and the three captured in the field, estimated to be two or three days of age, were all readily infected. The unnatural host, the chick, yielded very poor results. In a chick, one specimen was recovered from the bursa Fabricii, apparently an unusual location for this specimen. Several experiments were designed in which a passerine bird and a gruiform bird were fed metacercariae from the same broodsac. In all such experiments the Rails, Coots or Gallinules became infected and the passerine birds remained negative. The number of adults recovered from some of these experiments was usually high, e.g., from 35 metacercariae fed to a day old Coot, 12 adults were recovered at autopsy.



EXPLANATION OF PLATE I

FIG. 1. Metacercaria of *Neoleuchloridium problematicum* showing main excretory ducts and Laurer's canal.
FIG. 2. Cuticle of metacercaria of *N. problematicum* showing sensory papillae and spines.
FIG. 3. Saggital section of *N. problematicum*. Note uterine glands, pars muscularis and junction of Laurer's canal with excretory bladder.
FIG. 4. Cuticle from dorsal surface of *N. problematicum* showing sensory papillae.
FIG. 5 Diagram of female genital system of adult, ventral view.
FIG. 6. Adult *N. problematicum*, dorsal view, from Florida Gallinule (*Gallinula chloropus*) eight days after feeding.
FIG. 7. Pustulated cirrus of *N. problematicum*.
FIG. 8. Adult *N. problematicum*, ventral view, from Coot (*Fulcia americana*), collected by E. L. Cheatum, drawn to same scale as other species. Note diminutive size.
FIG. 9. Adult *N. problematicum*, dorsal view, from Coot (*Fulica americana*), two days after feeding.
FIG. 11. Diagram of female genital system of metacercaria, dorsal view.
FIG. 12. Adult *N. problematicum*, dorsal view, from Sora Rail (*Porzana carolina*), from collection of A. McIntosh.
FIG. 13. Adult *N. problematicum*, dorsal view, from Coot (*Fulica americana*), eight days after feeding.
FIG. 14. Adult *N. problematicum*, ventral view, from Florida Gallinule (*Gallinula chloropus*), collected at the Erie Marshes.

Leucochloridium flavum TRAVASSOS, 1922
(Est. 50, fig. 29; Est. 51, figs. 30—32).

Comprimento 5 a 7,5 mm.; largura 2,5 a 3,5 mm. em exemplares comprimidos. Os exemplares não comprimidos apresentavam metade ou pouco mais destas dimensões. Corpo ellipsoide, de extremidades arredondadas; acetabulo muito desenvolvido, pré-equatorial, mede cerca de 1,3 mm.; ventosa oral sub-terminal; tão grande quanto o acetabulo, distancia entre o campo da ventosa oral e o do acetabulo cerca de 0,9 mm.; pharynge bem desenvolvido, mais largo que longo e tendo em torno da porção anterior cellulas glandulares, situado logo em seguida á ventosa, mede cerca de 0,34 mm. de comprimento por 0,40 mm. de maior largura; esophago nullo; cecos longos e muito largos sobretudo na porção terminal, a porção inicial é relativamente delgada e de direcção transversal formando angulo recto, terminam junto á extremidade posterior; póro genital situado ao nivel da terminação dos cecos, a cerca de 0,2 mm. da extremidade posterior; bolsa do cirrus grande com estrangulamento na porção central, com volumoso cirrus protactil e vesicula seminal; da parte posterior parte um canal deferente unico, dilatado em vesicula seminal allongada, depois bifurcando-se em dois curtos canaes divergentes que vão ter aos testiculos; a bolsa se extende do póro genital até a zona do testiculo posterior inclusive; testiculos lobados, com zonas separadas pela zona do ovario e com campos em contacto, medem cerca de 0,5 a 0,6 mm. de diametro; ovario redondo, entre as zonas testiculares e no campo do testiculo posterior, mede cerca de metade do diametro dos testiculos; glandula de Mehlis na zona do ovario; utero constituido por um ramo ascendente que circunda o acetabulo, tornando-se descendente até o póro genital onde termina em uma volumosa vagina; fica situado na area intra-cecal e cecal; ovos de côr castanho escuro, operculados, um tanto asymetricos, medem cerca de 0,027 mm. por 0,017 mm.; vitellinos na area extra-cecal e cecal, ao longo de toda a porção descendente dos cecos.

Habitat: Cloaca de *Gallinula galeata*.

A evolução desta especie se realiza em molluscos do genero *Homalonyx* em cerca de 50 dias. Obtivemos a infestação esperimental contaminando com os ovos maduros as folhas que serviam para a alimentação dos molluscos observando o apparecimento dos cystos na antenna em cerca de 50 dias.

Os cystos maduros contém distomulos muito grandes, são fusiformes e medem cerca de 10 a 15 mm. de comprimento por 2 mm. de diametro e têm um filamento ás vezes do dobro do comprimento do cysto; a porção que fica no interior do corpo do caramujo é branca e transparente tendo na base do prolongamento que une ao nucleo do sporocysto extriações longitudinaes pardas. A metade que faz saliencia na antenna do mollusco é de côr amarello sujo, tendo exactamente no ponto onde fica a base da antenna um annel de côr parda; na extremidade livre tem tambem collocação mais carregada pela presença de pequenas manchas dispostas em linhas circulares em numero de 5 e a ponta é tambem de côr mais escura; contém no interior 11 á 14 distomulos, de cerca de 1 mm. de comprimento. Nestes distomulos o acetabulo é menor que a ventosa oral; nelles pode-se observar o tubo digestivo e os rudimentos dos testiculos, ovario e bolsa do cirrus. Na infestação esperimental obtivemos ovos em cerca de 15 dias.

Esta especie não é rara nos arredores de Mangaratiba e os molluscos hospedadores são muito communs nas plantações de agrião do Rio de Janeiro. Encontrámos este invertebrado nos pantanaes de Matto Grosso, na vegetação fluctuante dos rios e lagôas.

1 Neoleucochloridium flavum (Trav., 1922) Kagan, 1952

(syn. Leucochloridium flavum Travassos, 1922)

Neoleucochloridium holostomum (Rudolphi, 1819)Kagan, 1952

syn: Distomum holostomum Rudolphi, 1819

Leucochloridium holostomum (Rud., 1819) Lutz, 1922

Neoleucochloridium hypotaenidiarum (Tubangui, 1932)
Kagan, 1952

syn: Leucochloridium hypotaenidiarum Tub., 1932

Neoleucochloridium japonicum (Ishii, 1933) Kagan, 1952

syn: Leucochloridium japonicum Ishii, 1933

NEOLEUCOCHLORIDIUM

GENUS UROGONIMUS MONTICELLI, 1888

(Leucochloridiinae)

generic diagnosis from Kagan (1952):

Leucochloridiinae: Distomes rounded at both ends. Suckers large and well developed. Cuticula with or without spines. Genital pore terminal or slightly subterminal. Excretory pore dorsal, anterior to genital pore. Laurer's canal opening dorsally anterior to excretory pore. Uterus ascending to level of oral sucker, returning on same side of body and circling posterior rim of acetabulum, then passing over to other side of body and after ascending to level of oral sucker reversing and terminating at genital pore. Metraterm bulbous, muscular. Cirrus pouch, when present, muscular, small. Vesicula seminalis bulbous, muscular, attached to cirrus pouch. Cirrus round, short, stubby. Genitalia in tandem or triangular arrangement. Seminal receptacle present. Vitellaria lateral, extending posteriad beyond testes. Parasites in digestive tract of passerine birds. Type species: Urogonimus macrostomus (Rudolphi, 1803).

[TYPE SPECIES]
tod: yet genus is 1888
and species is 1892

Urogonimus macrostomus (Rudolphi, 1803) Monticelli, 1892

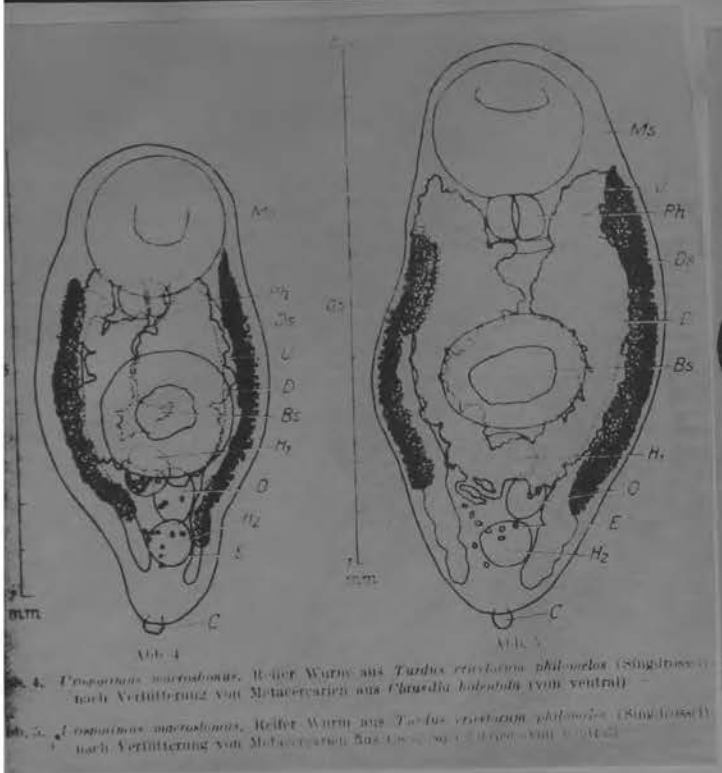
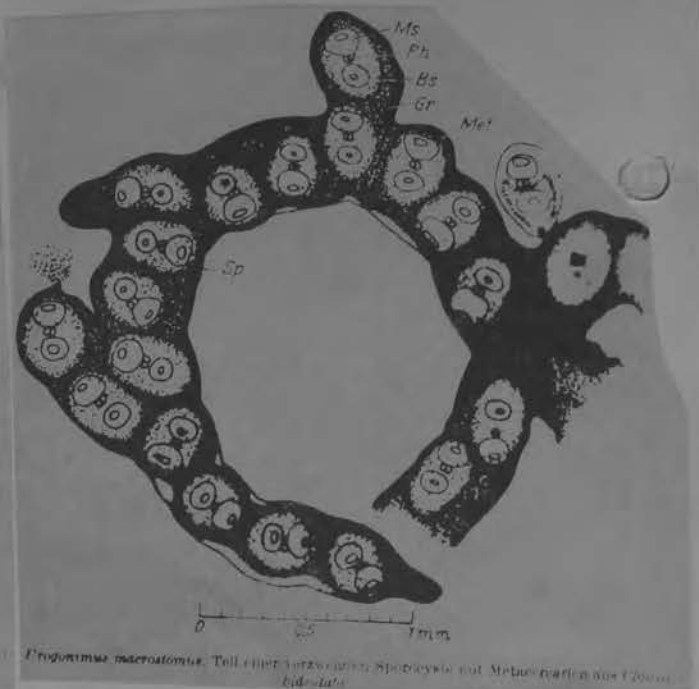


Abb. 4. *Urogonimus macrostomus*. Reifer Wurm aus *Turdus ruficollis philomelos* (Singdrossel) nach Verfütterung von Metacercarien aus *Clausilia bidentata* (von ventral)

Abb. 5. *Urogonimus macrostomus*. Reifer Wurm aus *Turdus ruficollis philomelos* (Singdrossel) nach Verfütterung von Metacercarien aus *Clausilia bidentata* (von ventral)



Urogonimus macrostomus. Teil einer Querschnitts-Serie eines Metacercarien aus *Clausilia bidentata*

Schmidt (1965)

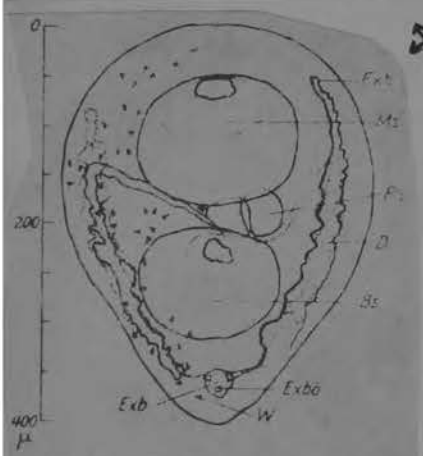
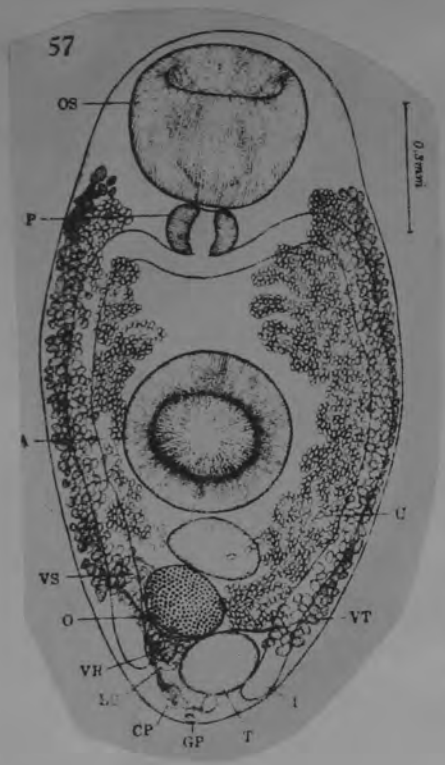


Abb. 3. *Urogonimus macrostomus*. Metacercarie aus *Clausilia bidentata* (von ventral)



Urogonimus cardis (Yamaguti, 1939)Kagan, 1952

syn: Leucochloridium cardis Yamaguti, 1939

in:

61. *Leucochlordium cardis* n. sp.

Pl. XXVII, Fig. 57.

A single mature specimen was found associated with the preceding worm in the cloaca of *Turdus cardis cardis* Temm. It was fixed in acetic sublimate under a cover slip and stained with hematoxylin-eosin.

* So called because of its structure.

Body flattened elliptical, 1.65 mm long by 0.85 mm broad at middle; hindbody more attenuated than forebody. Oral sucker subterminal, 0.4 mm in diameter. Pharynx 0.108 × 0.17 mm. Prepharynx and esophagus very short. Left cecum ending near posterior end of posterior testis, right one a little more anteriorly, the line connecting the two tips contiguous with posterior margin of posterior testis. Acetabulum 0.375 × 0.4 mm, with its center at middle of fourth sixth of body. Testes oval, tandem, with ovary between, their field overlapping the latter, anterior testis 0.15 × 0.2 mm, nearly median, immediately behind acetabulum; posterior testis 0.2 × 0.13 mm, slightly to left of median line, oblique. Vesicula seminalis winding on the right of ovary. Pars prostatica distinct. Cirrus pouch oval, 35 μ wide, containing convoluted ductus ejaculatorius. Genital pore dorsoterminal. Ovary subglobular, 0.19 × 0.15 mm, only slightly to right of median line at about middle of hindbody. Laurer's canal swollen at its proximal portion, opening on middorsal surface at level of posterior testis. Vitellaria commencing at level of posterior portion of oral sucker, terminating at level of ovary on the right and of anterior part of posterior testis on the left. The right vitelline duct crosses the vesicula seminalis dorsally and unites immediately behind the ovary with its fellow coming ventrally between the ovary and the posterior testis. Vitelline reservoir and shell gland immediately posterior to ovary, between right cecum and posterior testis. The uterus ascending first in the right submedian field turns backwards between the anterior end of the right vitellarium and the right cecal angle and after crossing to the left in the hindbody extends on this side as far as the anterior end of the left vitellarium; finally it forms a bulbous swelling surrounded by accompanying cells before leading into the very narrow metraterm. Eggs oval, light brown, thick-shelled, 22-27 × 11-20 μ.

This species differs from the most closely related *Leucochloridium sciuri* McIntosh, 1933, in the relative size of the suckers, in the anterior testis being contiguous with the ovary as well as with the acetabulum, and in the ovary and testes not being arranged in a linear series.

Urogonimus caryocatactis (Zeder, 1800) Kagan, 1952

-see Kagan (1952) pp 268-269
Am Midl Nat 48(2)

Urogonimus cercatus (Monticelli, 1893) M., 1893

syn: Distomum cercatum Monticelli, 1893

Leucochloridium cercatum (Mont., 1893) Mönnig, 1922

Urogonimus certhiae (McIntosh, 1927) Kagan, 1952

syn: Leucochloridium certhiae McIntosh, 1927

Length 1·6848 mm.; width 1·0206 mm.; measurements from compressed specimen. In specimen sectioned and not compressed, dorsal surface of body very strongly convex, ventral surface slightly convex. Maximum width of sectioned specimen, 0·6318 mm.; greatest thickness, 0·4617 mm. Oral sucker terminal (slightly depressed ventrally in specimen illustrated), measuring 0·4536 by 0·5340 mm. Pharynx muscular, following immediately after oral sucker, diameter, 0·2242 mm., length, 0·1520 mm. Oesophagus very short, distinguishable only in cross-section. Acetabulum about equal in diameter to oral sucker, measuring 0·4860 by 0·5340 mm. Genital pore median and terminal. Cirrus sac small, length 0·18 mm., diameter 0·07 mm. Cirrus small, extending into genital atrium to opening of genital pore. Testes large; anterior testis partly overlapped on anterior margin by acetabulum, posterior margin overlapping anterior margin of ovary. Posterior testis directly posterior to ovary and adjacent to it, about equal in size to anterior testis, measuring 0·19 by 0·32 mm. In sectioned specimen anterior testis 0·2268 by 0·24 mm.; posterior, slightly larger measuring 0·2268 by 0·2560 mm. Vas efferens of anterior testis large and convoluted, acting as a seminal vesicle for this organ. Ovary small, egg-shaped, situated between testes, almost entirely to left of median line of body, measuring 0·12 by 0·20 mm. In sectioned specimen ovary almost spherical, measuring 0·12 mm. in diameter. Uterus filled with eggs, much convoluted, extending laterally on each side to vitellaria, anteriorly to oral sucker and ending posteriorly to right of median line, emptying into genital atrium. Eggs numerous, 0·0266 by 0·0190 mm.; light yellow to very dark brown, darkest coloured eggs in right side of body at posterior end. Vitellaria extra-coecal extending anteriorly to about one-third of the depth of anterior sucker, and posteriorly to about middle level of posterior testis.

Habitat: Cloaca of Brown Creeper (*Certhia familiaris americana*).

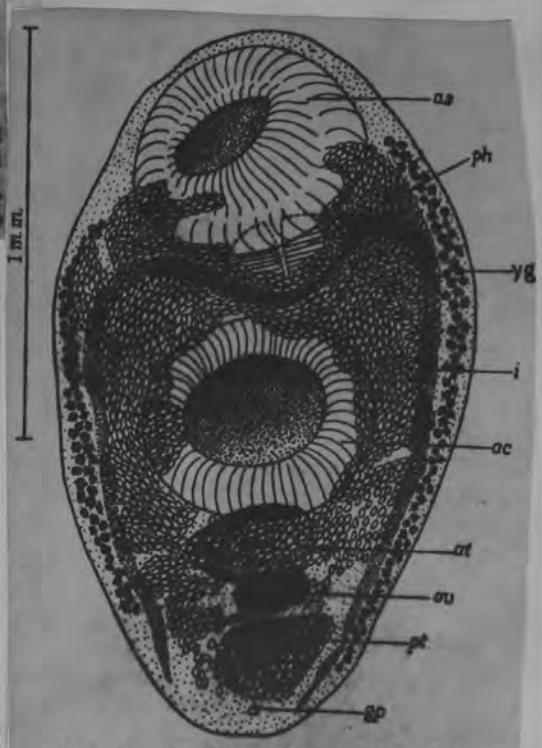


Fig. 1. *Leucochloridium certhiae* n. sp., ventral aspect.

↖↑McIntosh (1927)

Leucochloridium certhiae was described from the brown creeper, *Certhia familiaris americana*, from Minnesota in 1927 by the writer. This species is characterized by unusually large testes, the diameters of which are about twice the diameter of the ovary. In Michigan this parasite was not taken from the brown creeper, of which only a single specimen was examined, but was found in the song sparrow, *Melospiza melodia beata*. The specimens from the song sparrow differ only in minute detail from the type specimen.

Witenberg (1925) described a trematode from *Muscicapa grisola–M. striata* which he called *Leucochloridium* sp. This form is also characterized by large testes which almost fill the region of the body posterior to the acetabulum. There is no doubt but that this Old World species is closely related to, if not identical with, *L. certhiae*.

Type specimen.—U. S. Nat. Mus. Helm. Coll. No. 32392.

Hosts.—Certhia familiaris americana (brown creeper); *Melospiza melodia beata* (song sparrow); and (?) *Muscicapa striata* (spotted flycatcher).

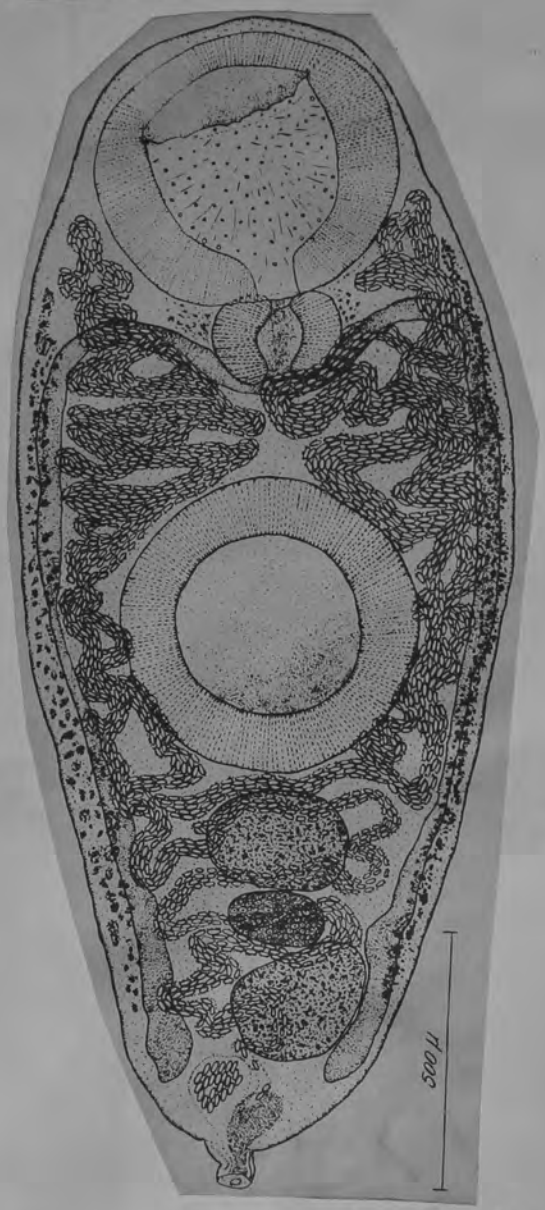
Location.—Cloaca.

Localities.—Minnesota (St. Paul); Michigan (Monro Lake); and (?) Tschardschuj (in Buchara).

–McIntosh (1932)

over

U. certhiae



- from McIntosh (1932)

Abstract from
Proceedings of the Nebraska Academy of Sciences
April 28-29, 1967

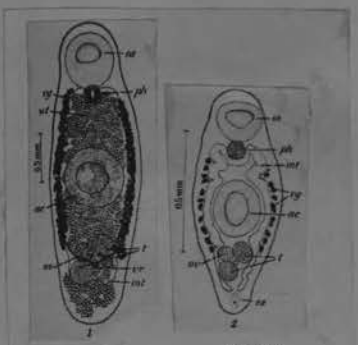
THE LIFE CYCLE OF **UROGONIMUS CERTHIAE** (MCINTOSH, 1927) KAGAN, 1952 (TREMATODA: BRACHYLAIMIDAE)

Paul D. Lewis, Jr., Department of Zoology and Physiology, University of Nebraska

The digestive glands of land snails, **Cionella lubrica** (Müller) from Grove Lake Recreation Area, Antelope County, Nebraska are parasitized by white, highly branched sporocysts. The sporocysts contain numerous oval cercariaea and some granular material, but few germinal masses or cercarial embryos. Feeding experiments with several species of mammals proved negative, but sexually mature adult flukes were recovered from the cloacas of young chickens after 15 days. The adult flukes were identified as **Urogonimus certhiae** (McIntosh, 1927) Kagan, 1952. **U. certhiae** has been reported from passerine birds in North America (McIntosh, 1927, Parasitol. 19:353-364; McIntosh, 1932, J. Parasitol. 19:32-53; Kagan, 1952, Am. Midl. Nat. 48:257-301), but this is the first report of its occurrence in Nebraska and the first account of its life cycle. The only other life cycle known in the genus is that of **U. macrostoma** (Rudolphi) reported by Schmidt (1965, Ztschr. Parasitenk. 26:1-17) in Europe.

Urogonimus dasylophi (Tubangui, 1928) Kagan, 1952

syn: Leucochloridium dasylophi Tubangui, 1928



FROM TUBANGUI, 1928

Urogonimus dryobatae (McIntosh, 1932) Kagan, 1952
Syn: Leucochloridium dryobatae McIntosh, 1932

Leucochloridium dryobatae n. sp. McIntosh, 1932

Fig. 7.

Specific diagnosis: Body 2.19 mm. long by 1.28 mm. wide, flat, ovate, with greatest width across anterior margin of acetabulum. Oral sucker 480 μ by 560 μ, slightly subterminal. Pharynx 170 μ by 230 μ. Esophagus very short. Intestinal crura terminate a short distance beyond posterior testis, the tips 270 μ apart. Acetabulum 570 μ by 620 μ, slightly post-equatorial. Reproductive glands arranged in a linear series; anterior testis 160 μ by 200 μ, situated near median line of body, and about half its diameter from acetabulum; posterior testis 140 μ by 190 μ, situated to left of median line of body and in contact with posterior extremity of left branch of intestinal crura. Cirrus pouch small, 60 μ in diameter; cirrus short. Genital pore at posterior end of body, median and terminal. Ovary 170 μ by 220 μ, in line with testes. Each reproductive gland occupies a separate zone but their fields coincide, at least in part. Fecundarium indistinct. Vitellaria extracecal, ending posteriorly at about level of posterior zone of ovary, and anteriorly at level of posterior fourth of oral sucker. Metraterm muscular, situated to right of median line of body. Uterus filled with eggs, occupying all available intercecal space and extending into and filling area lateral to pharynx and oral sucker. Eggs 25 μ by 18 μ.

Type specimen.—U. S. Nat. Mus. Helm. Coll. No. 32402.

Host.—*Dryobates villosus villosus* (hairy woodpecker).

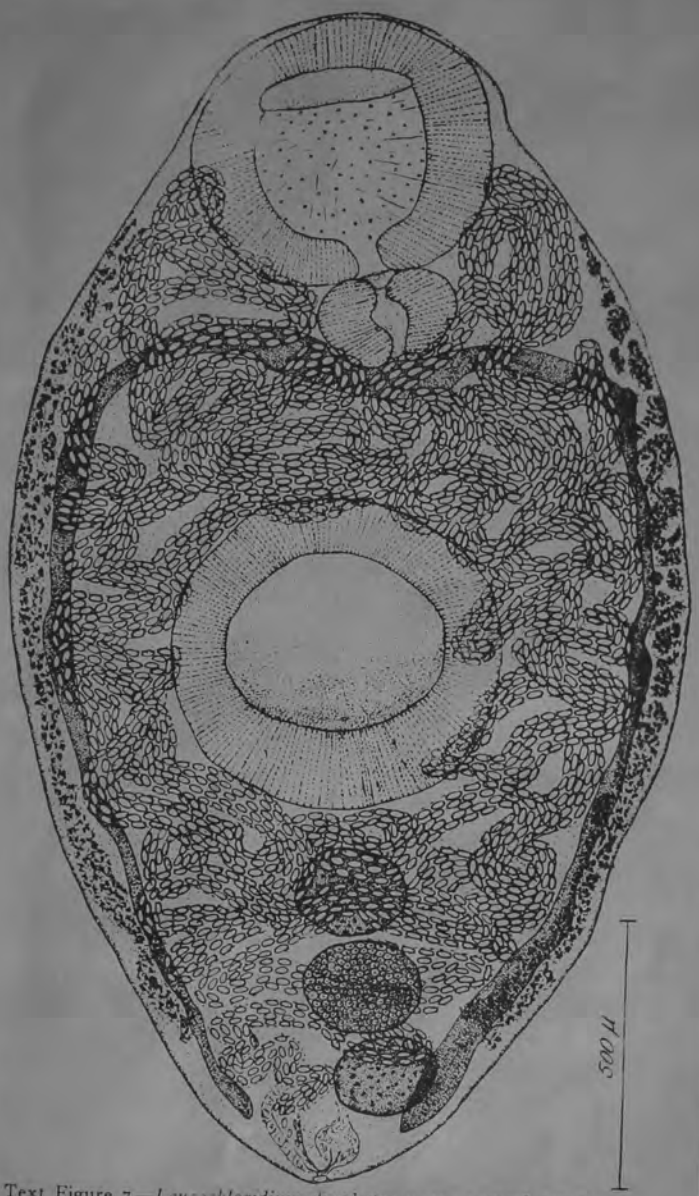
Location.—Cloaca.

Locality.—Michigan (Hook Point on Douglas Lake).

In the above species the reproductive glands are arranged in linear series similar to the arrangement found in *L. sciuri*, which is a much smaller form. But, aside from the difference in size and shape, the two species may be readily separated by the position of the uterus, which in *L. sciuri* is largely confined to the intercecal area, while in *L. dryobatae* it extends into the area lateral to the anterior sucker.

In addition to the type host, hairy woodpecker, *Dryobates villosus villosus*, the following species of birds taken at Douglas Lake, Michigan, harbored flukes which are at present identified as *L. dryobatae:* Yellow-bellied sapsucker, *Sphyrapicus varius varius;* towhee, *Pipilo erythrophthalmus erythrophthalmus;* scarlet tanager, *Piranga erythro-*

melas; red-eyed vireo, *Vireosylva olivacea;* cowbird, *Molothrus ater ater;* and song sparrow, *Melospiza melodia beata.* There is some variation in the arrangement of the sex glands in the specimens from the different hosts, but the variation does not appear to be greater than that existing in a series of individuals from a single host.



Text Figure 7.—*Leucochloridium dryobatae* n. sp., ventral aspect.

Urogonimus icteri (McIntosh, 1927) Kagan, 1952

syn: Leucochloridium icteri McIntosh, 1927

This species is characterized by the triangular arrangement of the reproductive glands, and by the vitellaria ending anteriorly in zone of oral sucker and terminating posteriorly in zone of posterior testis.

Type specimen.—U. S. Nat. Mus. Helm. Coll. No. 32394.

Host.—*Icterus galbula* (Baltimore oriole).

Location.—Rectum.

Locality.—Minnesota (University Farm, St. Paul).

Leucochloridium icteri n. sp. (Fig. 3).

Length 2 mm.; width 1·053 mm. in specimen slightly compressed. Oral sucker 0·405 by 0·4455 mm.; acetabulum 0·4212 by 0·4536 mm.; pharynx 0·1296 mm. long, 0·1782 mm. in diameter. Oesophagus very short; intestinal crura very distinct, extending lateral to vitellaria, then turning abruptly posteriorly to about equatorial level of posterior testis. Vitellaria very pronounced, extra-coecal, extending from near middle of zone of oral sucker to about equatorial level of ovary. Uterus very much convoluted, filled with eggs and occupying most of available space posterior to anterior sucker. Eggs 0·0251 by 0·0152 mm., light yellow to very dark brown, the dark brown, more mature eggs surrounding the reproductive organs. Testes almost spherical, about equal in diameter, measuring 0·17 mm., anterior testis to left of median line and separated one and one-fourth times its diameter from acetabulum; posterior testis located in median line, about equal distance from and at level of ends of crura, and separated by less than half its diameter from anterior testis and ovary. Ovary spherical, situated to left of median line and opposite the testicular interval, a little nearer the posterior than the anterior testis; the diameter is somewhat less than that of either testis, measuring 0·1539 mm. In whole mounts when viewed from ventral side the testes almost completely obscured by dark-coloured eggs. The three reproductive organs form points of a triangle which approaches that of an equilateral triangle. Cirrus sac present, 0·196 mm. long, 0·065 mm. in diameter. Genital pore median and ventral, about 0·070 mm. from posterior end. Uterus entering the very short genital atrium on left side from cirrus sac. In other species studied from cross-sections the uterus enters on right side from cirrus sac. Excretory pore dorsal, about 0·028 mm. from posterior end; excretory canal extending anteriorly for 0·056 mm. before branching. Laurer's canal not recognisable. Many large nucleated cells surrounding vasa efferentia and vas deferens, probably prostatic in function.

Habitat: Rectum of Baltimore Oriole (*Icterus galbula*).

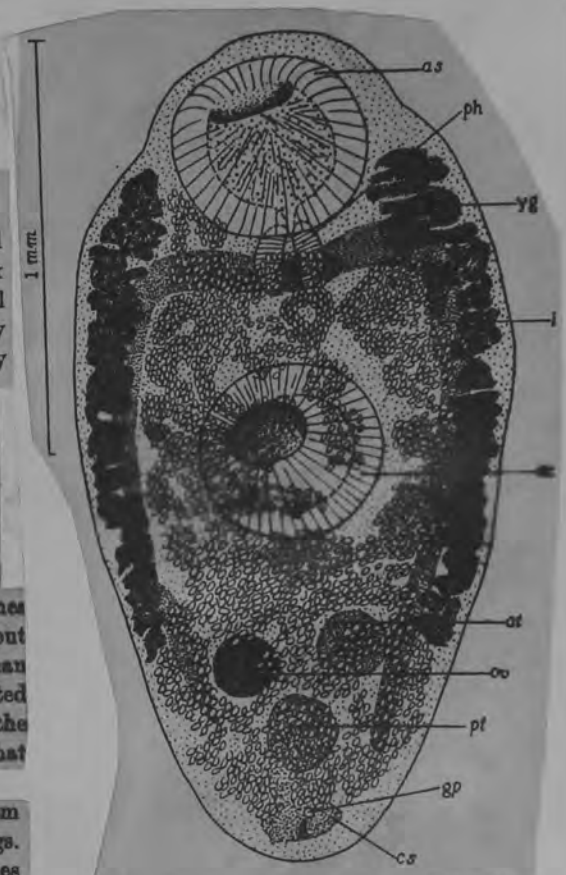


Fig. 3. *Leucochloridium icteri* n. sp., ventral aspect.

Urogoninus indicus (Singh, 1962) PDL

~~Prachylaemidae~~

Urogoninae ?

[Syn: LEUCOCHLORIDIUM INDICUM ~~n. sp.~~ K. S. SINGH, 1962]

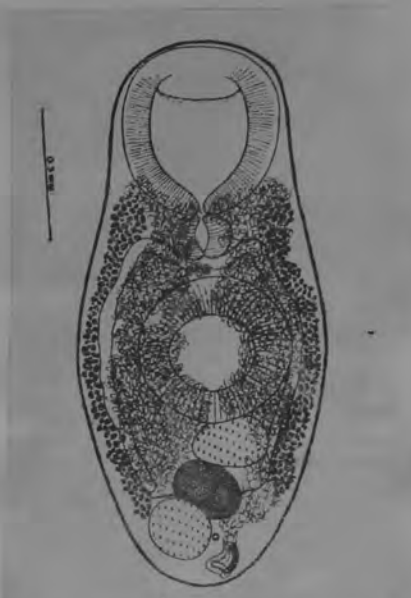
The parasites are fleshy, thick and rather small in size, measuring 1.157-1.442 (1.311) mm. in length and 0.579-0.801 (0.666) mm. in maximum breadth which is almost in the middle of the body. From this region, the body narrows slightly on the sides, and the two ends are broadly rounded. The cuticle is provided with small spines all over the body but these hardly project beyond the cuticle.

The oral sucker is subterminal and very well developed and muscular, and the anterior end of the body is broader than the posterior end. The mouth opening is directed anteriorly but is present on the ventral side. The sucker is rounded to oval in shape and measures 0.356-0.401 (0.386) mm. in diameter. The prepharyx is absent and the pharynx is well developed and muscular. It is rounded and measures 0.16-0.176 (0.164) mm. in diameter. The oesophagus is absent and the comparatively wide caeca run anteriorly forming the arch and then run along the lateral sides, reaching the posterior region of the body. The ventral sucker also is well developed and muscular and measures as much as the oral sucker, being 0.356-0.427 (0.36) mm. in diameter. It is present almost in the middle or just posterior to the middle of the body.

The two testes are present one behind the other, though slightly diagonally, in the posterior region of the body. The anterior testis, which is closely applied to the ventral sucker is usually a little on the right side of the median axis and the posterior testis which is present near the posterior end of the body, is a little on the left side of the axis. Both the testes are rounded to oval in shape and almost equal in size, measuring 0.12-0.17 (0.147) mm. in diameter. The two testes are usually separated by the ovary but in a few specimens, the ovary is present by the side of the posterior testis. The cirrus pouch is present near the posterior end and is not very distinct and is partly obscured by the eggs. In two specimens, the cirrus was seen everted. It is a clumsy papilla-like structure with broad free end. It measures about 0.056 mm. in length and the distal end is 0.04 in diameter. The genital pore is present on the dorsal side and is subterminal.

The ovary is rounded or oval in shape and its position is variable as described above. It is 0.1-0.16 (0.125) mm. in diameter. The vitelline follicles are present on the lateral sides and extend from the region of the base of the oral sucker upto the anterior region of the posterior testis. The two transverse vitelline ducts are present in the region of the ovary and join posterolateral to it. Further details could not be made out. The uterus is extensively developed and occupies most of the region on the lateral sides extending upto the base of the oral sucker. Posteriorly, the uterus opens by the side of the male genital pore and the terminal part of the uterus is thick-walled and surrounded by well developed sphincter muscles forming the metraterm. There are numerous, dark brown, operculate and embryonated eggs, measuring 0.026-0.03 × 0.016-0.018 (0.0276 × 0.017) mm.

The excretory pore is present on the dorsal side, 0.096-0.11 (0.102) mm. from the posterior end.



Leucochloridium indicum n. sp. Dorsal view.

-OVER-

Discussion : The genus *Leucochloridium* Carus, 1835, contains 39 species reported from birds though none has been described from India. Only one species, *L. ceyloncium*,, has been described from *Gallus lafayetti* from Ceylon by Fernando (1952). The genus has been dealt with in detail by McIntosh (1932), Kagan (1952) and Neiland (1953).

The present species can be separated from closely related species thus : from *L. sime* Yamaguti, 1935 in having equal suckers, absence of prepharynx and oesophagus, position of genital organs, and extension of uterus in the anterior region; from *L. cardis* Yamaguti, 1939 in the absence of prepharynx and oesophagus, extension of vitellaria and uterus and in the position of the two testes and ovary; from *L. hypotaenidiarum* Tubangui, 1932 in the size of the body, presence of spines, position and comparative size of ventral sucker and position of ovary; from *L. perisorisae* Neiland, 1953, in having spines all over the body, in the position of ovary and testes, comparative size of the two suckers and size of eggs; from *L. beauforti* Hunter & Vernberg, 1952 in the size of body, presence of spines on cuticle all over the body, equal size of the suckers, position of the testes and ovary and position of uterus; from *L. dryobatae* McIntosh, 1932 in the size of the body, in having the maximum width in the equatorial region, absence of oesophagus, in having almost equal suckers, comparatively large gonads (which though present in a line, are oblique to the rest of the body); from *L. mniotiltae* McIntosh, 1927 in the extension of the uterus in the area lateral to oral sucker, and in the nature of the fecundarium; from *L. seiuri* McIntosh, 1932 in the forward extension of the uterus, shape and size of body, in the relative size of the two suckers and relative size of the gonads.

From February to July, eighteen specimens of the Himalayan Red-Crowned Jay, *Garrulus bispecularis* Vigors were examined and only one bird examined on June 24th was found infected with seventeen specimens of trematodes. The parasites were recovered from the intestine, fixed under slight pressure in alcohol and stained with acetic alum carmine. The study is based on nine specimens mounted whole and measured, the average measurements being given in parentheses. All the specimens contained a very large number of small eggs which sometimes obscured the detailed study of the genital system.

Host : Himalayan Red-Crowned Jay, *Garrulus bispecularis* Vigors.

Location : Intestine.

Locality : Mukteswar-Kumaun (Ht. 7,500 ft.).

Type Specimen : Zoological Survey of India, Calcutta.

INDIAN J. HELMINTHOL. 14(1): 57-61

Urogonimus insignis Looss, 1899

(syn: *Leucochloridium insigne* (Looss, 1899) Mönnig, 1922)

Urogonimus mesostomus (Rudolphi, 1803) Kagan, 1952

[sp. dubia]

iis is a small species, characterized by vitellaria not extending iorly as far as the intestinal crura, testes and ovary arranged in ar series, a well developed fecundarium, and the uterus confined t-oral area.

Type specimen.—U. S. Nat. Mus. Helm. Coll. No. 32393.

Host.—*Mniotilta varia* (black-and-white warbler).

Location.—Large intestine.

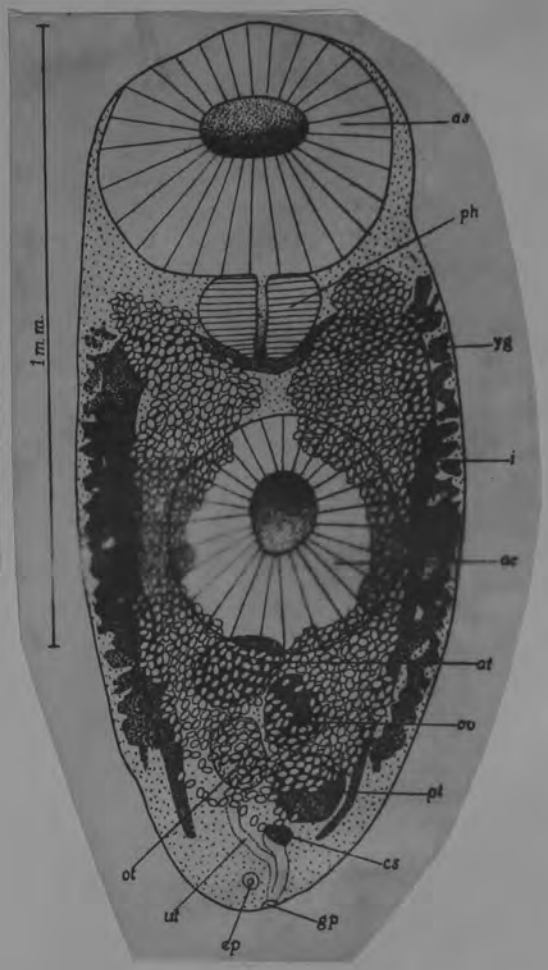
Locality.—Minnesota (University Farm, St. Paul).

Urogonimus mniotiltae (McIntosh, 1927) Kagan, 1952

syn: **Leucochloridium mniotiltae** McIntosh, 1927

ngth 1·4134 mm.; width 0·6318 mm.; oral sucker 0·3888 by 0·4536 mm.; nx 0·1296 mm. long, 0·1944 mm. in diameter; oesophagus very short; inal crura widest at point of curvature, tapering gradually and ending ly posterior to zone of posterior testis. Acetabulum 0·3888 mm. in ter. Testes about equal in size, measuring 0·1292 by 0·1102 mm. ior testis overlapped ventrally on its anterior margin by ventral sucker, reater part to right of median line, but not touching intestinal coecum. rior testis diagonally posterior to anterior testis, a little removed from an line and adjacent to inner margin of intestinal coecum. Ovary a little r than wide, measuring 0·114 by 0·100 mm., occupying space between wo testes. Ootype present, about equal to ovary in size and situated ht of posterior testis. Uterus filled with eggs, occupying intercoecal space ea of reproductive organs, forward to anterior level of pharynx; area of ynx and most of acetabulum free from eggs. Eggs 0·030 by 0·019 mm. tal pore median and terminal. Cirrus sac small, 0·120 mm. long, 0·070 mm. ameter. Vitellaria extra-coecal, extending from about level of anterior in of pharynx to about equatorial level of posterior testis. Excretory dorsal, about 0·048 mm. from posterior end. Laurer's canal opening lly, about 0·016 mm. anterior to excretory pore.

Habitat: Large intestine of Black and White Warbler (*Mniotilta varia*).



Leucochloridium parcum TRAVASSOS, 1922
(Est. 52, fig. 33).

Comprimento 1 a 2,1 mm.; largura 0,7 a 1 mm.; corpo achatado, cymbiforme; acetabulo equatorial, maior que a ventosa oral, mede cerca de 0,53 mm. de diametro; ventosa oral sub-terminal com cerca de 0,50 mm. de diametro, campo da ventosa oral distante do campo do acetabulo cerca de um diametro ou pouco menos; pharynge em seguida á ventosa oral, forte, mede cerca de 0,19 mm. de comprimento por 0,12 mm. de largura; esophago nullo; cecos delgados, primeiramente dirigidos para fora e em seguida para traz indo terminar perto da extremidade posterior, na zona do testiculo; póro genital sub-terminal, bem abaixo da terminação dos cecos; bolsa do cirrus volumosa, com estrangulamento mediano, mede cerca de 0,31 mm. de comprimento atravessando toda a zona do testiculo posterior; testiculos redondos, de contorno regular, com zonas em contacto e campos parcialmente superpostos, medem cerca de 0,20 a 0,26 mm. de diametro medio; ovario redondo, na zona do testiculo anterior e no campo do posterior, mede cerca de 0,10 a 0,13 mm. de diametro, utero muito desenvolvido occupando todo o corpo com excepção da area da ventosa oral; suas alças envolvem os testiculos e vão bem abaixo das terminações dos cecos; ovos com cerca de 0,028 mm. de comprimento por 0,017 mm. de maior largura; vitellinos extra-cecaes invadindo parcialmente a area cecal, ultrapassando anteriormente os ramos intestinaes e entrando na zona da ventosa oral e posteriormente no meio da zona do testiculo anterior.

Habitat: Cloaca de *Ostinops decumanus*, uma vez em 10 aves examinadas.

Encontramos tambem esta especie em Angra dos Reis, em *Tachyphonus cristatus fraseri*.

LUTZ, em seu trabalho sobre *Leucochloridium*, refere a presença deste genero em *Parra jacana* e *Passer domesticus*; destes parasitos dá figuras que infelizmente não são boas. O de *P. jacana* se approxima pelas dimensões do *L. flavum*, havendo differença no tamanho das ventosas e o de *P. domesticus* se approxima muito do *L. parcum* embora o acetabulo esteja relativamente mais afastado da ventosa oral. Nada se pode concluir pela deficiencia das figuras e não ter sido feita uma descripção.

from Travassos (1928)

Urogonimus parcus (Travassos, 1922) Kagan, 1952

syn: Leucochloridium parcum Travassos, 1922

L-P
Travassos, 1922
Folha Medica 3(24): 187-190
"Informações sobre a fauna helminthologica Matta Grosso. [Pt. I]"

[*Urogonimus rossittensis* Muehling, 1898]

[see *Urotocus rossittensis*]

Urogonimus seiuri (McIntosh, 1932) Kagan, 1952

syn: Leucochloridium seiuri McIntosh, 1932

Specific diagnosis: Body 1.73 mm. long by 750 μ wide, broadest at acetabulum, posterior part narrower and more attenuated than anterior half. Oral sucker 450 μ by 470 μ, subterminal. Pharynx 210 μ by 220 μ. Esophagus very short. Intestinal crura end near zone of cirrus pouch, the tips 160 μ apart. Acetabulum 420 μ by 440 μ, slightly post-equatorial. Reproductive glands about equal in size, arranged in a linear series diagonal to longitudinal axis of body; anterior testis 80 μ by 90 μ, located slightly to right of median line and less than half its diameter from acetabulum; posterior testis 100 μ by 70 μ, located near posterior extremity of left branch of intestinal crura; testicular fields contiguous. Cirrus pouch 50 μ in diameter; cirrus short and bulbous, measuring, when protruded, 40 μ long by 54 μ wide. Genital pore at posterior end, mediodorsal and subterminal. Ovary 80 μ by 90 μ, situated partly in field of both testes with its zone contiguous with zone of posterior testis. Fecundarium indistinct. Vitellaria end posteriorly at level of posterior testis, and anteriorly at zone of posterior portion of oral sucker. Uterus filled with numerous eggs, confined largely to intercecal space but sometimes sending a loop forward on one side into extracecal area as far as oral sucker. Metraterm well developed. Eggs 23 μ by 18 μ.

Type specimen.—U. S. Nat. Mus. Helm. Coll. No. 32401.

Host.—Seiurus aurocapillus aurocapillus (oven bird).

Location.—Cloaca.

Locality.—Michigan (Mott Lake near Douglas Lake).

The above species, with the decidedly tapering posterior end, the linear arrangement of the reproductive glands, and with no anterior extension of the uterus into the area lateral to the oral sucker, is distinctly different from the other species of the genus *Leucochloridium*.

Urogonimus turanicus Solov'ev, 1912

in: Totanus glareolus, bursa; Turkestan

Urogonimus turdi (Yamaguti, 1939) Kagan, 1952

syn: Leucochloridium turdi Yamaguti, 1939

60. *Leucochloridium turdi* n. sp.

PL XXVI, Fig. 53.

Six mature specimens were taken from the cloaca of *Turdus cardis cardis* Temm. from Kurama near Kyoto, October 22, 1937. They were fixed in acetic sublimate under cover glass pressure.

Body elliptical, somewhat flattened dorsoventrally, 1.0–2.65 mm long by 0.57–1.2 mm broad at middle. Oral sucker subterminal, 0.22–0.48 × 0.23–0.56 mm. Prepharynx and esophagus almost lacking. Pharynx 0.09–0.13 × 0.12–0.18 mm. Ceca turning backward at level of pharynx and terminating short of posterior extremity. Acetabulum 0.34–0.68 mm in diameter, with its posterior border intruding into caudal third of body or at its anterior limit.

Testes oval, 0.07–0.42 × 0.07–0.28 mm, obliquely tandem, with their long axes meeting at posttesticular level; the anterior on the left, a little behind acetabulum; the posterior on the right at about middle of caudal third of body or a little more posteriorly. Vesicula seminalis winding between two testes, running straight backward medial to posterior testis, near the posterior part of which it forms an elongate fusiform or nearly cylindrical pars musculosa* 126 μ long by 30 μ wide in the type and provided with a very thick coat of circular muscles. Pars prostatica distinct, tubular, narrower than pars musculosa, about 0.1 mm long in the type. Cirrus pouch muscular, oval or elliptical, 75 × 50 μ in the type, containing sinuous or twisted eversible ductus ejaculatorius. Genital pore ventroterminal.

Ovary subglobular to oval, 0.06–0.23 × 0.06–0.2 mm, opposite anterior testis and immediately anterodextral to posterior testis. Laurer's canal somewhat swollen near its origin. Shell gland posteromedial to ovary. Uterine coils filling up all available intercecal field; they may extend anteriorly to the area lateral to the pharynx as well as over the ventral surface of the intestinal crura. Ascending and descending portions of uterus in median field dorsal to acetabulum, terminal portion wide, provided with a thick coat of accompanying cells. Metraterm very narrow, about 50 μ long in the type, opening into genital atrium from left side. Eggs elliptical or asymmetrically oval, embryonated, 24–29 × 14–16 μ in life. Vitellaria acinous, extracecal, commencing on either side of posterior part of oral sucker; they terminate at the level of the ovary or the anterior end of the posterior testis on the right and a little back of the anterior testis on the left. Vitelline reservoir immediately sinistral to posterior testis.

Excretory vesicle saccular, comparatively small, dorsal to terminal genitalia, with terminal pore.

This species differs from the most closely related *Leucochloridium parcum* Travassos, 1922, in the extent of the vitellaria, and from *L. icteri* McIntosh, 1927 and *L. dasylophi* Tubangui, 1928, in the postequatorial position of the acetabulum and the extent of the vitellaria.

Urogonimus vireonis (McIntosh, 1927) Kagan, 1952

syn: Leucochloridium vireonis McIntosh, 1927

Leucochloridium vireonis McIntosh, 1927.

A comparatively large species, characterized by pre-equatorial acetabulum, vitellaria terminating posteriorly near zone of anterior testis, and by reproductive glands situated nearer to posterior end of body than to acetabulum.

Type specimen.—U. S. Nat. Mus. Helm. Coll. No. 32395.

Host.—*Vireo griseus griseus* (white-eyed vireo).

Location.—Large intestine.

Locality.—Mississippi (A. and M. College).

Length 2·5 mm.; width 0·95 mm.; body flat, width nearly uniform throughout, maximum breadth at posterior region of pharynx. Oral sucker somewhat broader than long, measuring 0·47 by 0·53 mm. Pharynx muscular, connected directly to oral sucker, length 0·1701 mm., diameter 0·2106 mm. Oesophagus very short or absent. Intestinal crura extending diagonally anteriorly on leaving oesophagus for about half the length of pharynx, then passing posteriorly to equatorial level of posterior testis; diameter of crura increasing at posterior extremities. Acetabulum slightly anterior to middle of body, diameter 0·57 mm. Anterior testis about equal distance from acetabulum and posterior end of body left of median line; length 0·2268 mm., width 0·1944 mm. Posterior testis 0·3078 by 0·2592 mm., situated between ends of intestinal crura, about one-third its diameter from posterior end of body and nearly median in position. Ovary to right of median line with its anterior margin at about equatorial level of anterior testis; almost spherical, about equal in size to anterior testis; measuring 0·2368 by 0·1822 mm. Uterus filled with eggs occupying the greater part of the body space posterior to anterior sucker, and overlapping intestinal crura and vitellaria in a few places. Eggs numerous, measuring 0·0247 by 0·0152 mm., light brown to dark brown in colour, the dark brown, more mature eggs posterior to ovarian zone and to left of testicular area. Vitellaria extra-coecal, extending from a point slightly anterior to posterior margin of oral sucker, to middle of ovarian zone; few of vitellarian follicles extending to inner margin of intestinal crura. Cirrus sac large, posterior and ventral to posterior testis.

Habitat: Large intestine of White-eyed Vireo (*Vireo griseus griseus*).

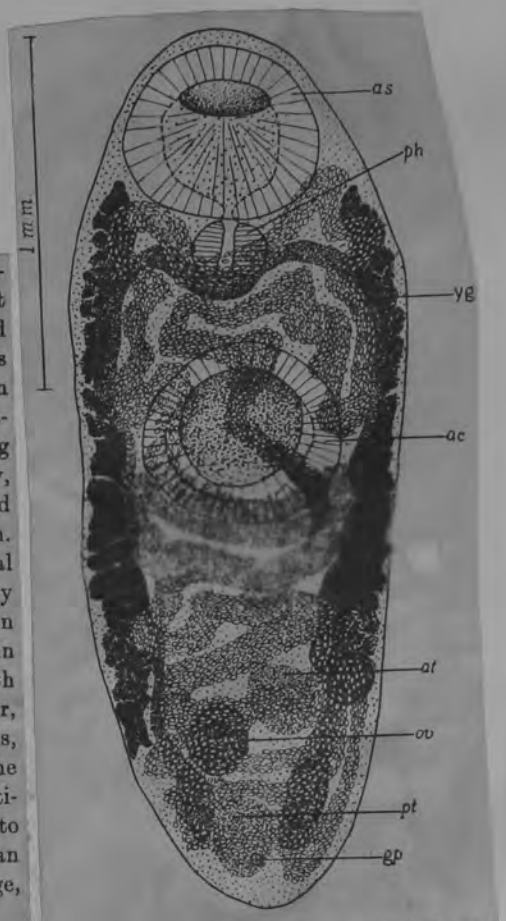


Fig. 4. *Leucochloridium vireonis* n. sp., ventral aspect.

Urogonimus witenbergi (Skrjabin, 1948) Kagan, 1952

Urogonimus witenbergiella Kagan, 1952

syn: Leucochloridium macrostomum of Witenberg, 1

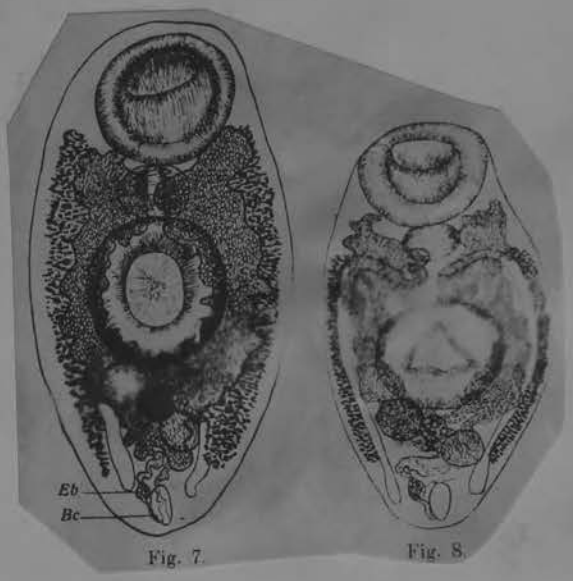
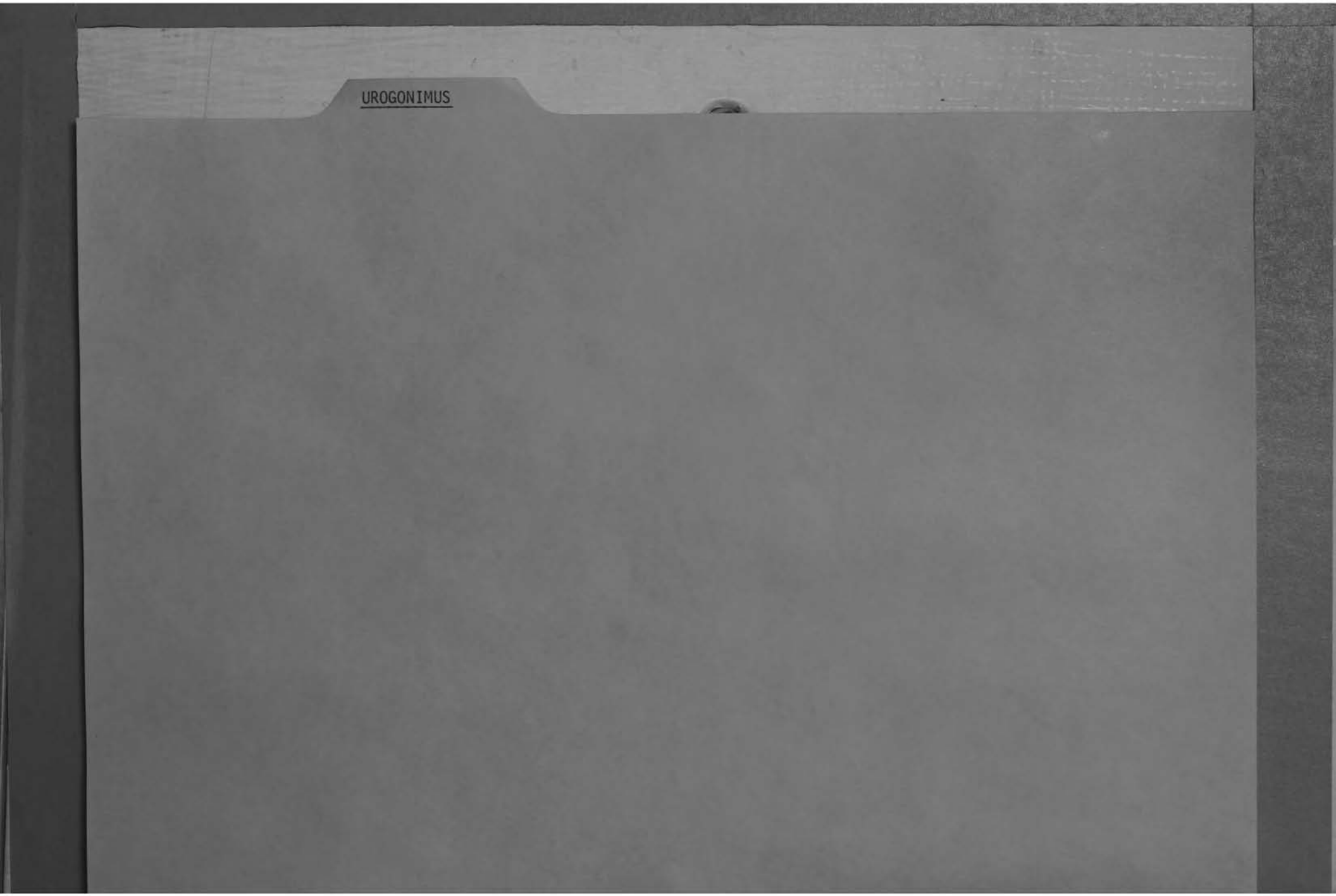


Fig. 7.

Fig. 8.


UROGONIMUS

tion » de la ventouse orale s'accompagne de modifications importantes dans la topographie des organes : les cæcums décrivent une courbe fortement concave en avant, entourant la ventouse orale ; ils présentent ensuite un point d'inflexion très brusque qui les ramène en arrière. Les glandes céphaliques et leurs canaux sont aussi affectés par ce phénomène : l'ensemble suit un trajet sinueux, à peu près parallèle à celui du tube digestif.

Les métacercaires mûres sont toujours entourées d'une couche de substance mucoïde dont l'épaisseur varie de 11 à 13 μ (fig. 15 et 17) et qui ne présente aucune interruption en regard de l'orifice excréteur. Cette formation est peu réfringente et a la consistance d'une gelée chez les sujets examinés *in vivo* ; elle donne les réactions caractéristiques des mucines et des substances mucoïdes : coloration rouge pourpre par le violet de méthyle (métachromasie) ; coloration aussi, mais moins intense, par la thionine phéniquée. Cette substance s'insinue profondément dans la dépression qui occupe la région antérieure invaginée, ainsi que dans les cavités des ventouses.

Des faits comparables ont été signalés par I. G. Kagan (1951) chez les métacercaires de *Neoleucochloridium problematicum* (Magath 1920), enkystées dans des sporocystes chez *Oxyloma* (*Succinea*) *retusa* à Ann-Arbor (Michigan). Cet auteur a observé une double couche de substance mucoïde qui se gonfle au contact de l'eau ; dans ces conditions, elles se séparent et deviennent très apparentes. I. G. Kagan pense que la substance mucoïde est élaborée à la fois par la paroi du sporocyste et par les glandes sous-cuticulaires de la métacercaire. E. E. Byrd (1940) parle aussi d'une « jelly-like substance » entourant une métacercaire de *Leucochloridium* ; il pense que cette formation, tout en assurant le rôle protecteur d'une enveloppe de kyste, contribue à la nutrition du parasite pendant sa période de repos.

Les coupes traitées par l'acide périodique et le réactif de Schiff, selon Hotchkiss-Mc Manus (fig. 19), montrent une réaction positive intense dans toute la zone cuticulaire et sous-cuticulaire ; il est ainsi établi que, chez la métacercaire d'*Urotocus*, la région périphérique est particulièrement riche en polysaccharides.

raccourcissement et élargissement très accusés de l'ensemble ; la longueur totale est ramenée à une valeur d'abord voisine de 250 μ et finalement de 200 μ. Quand la contraction est très accusée (fig. 15), la forme devient presque sphérique (200 × 170 μ). Cette « migra-

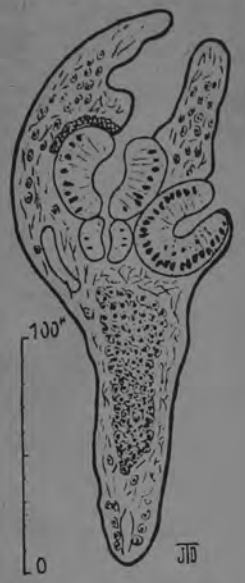


FIG. 16. — Coupe sagittale d'une métacercaire montrant l'invagination de la ventouse orale et du pharynx : les deux ventouses sont en contact.

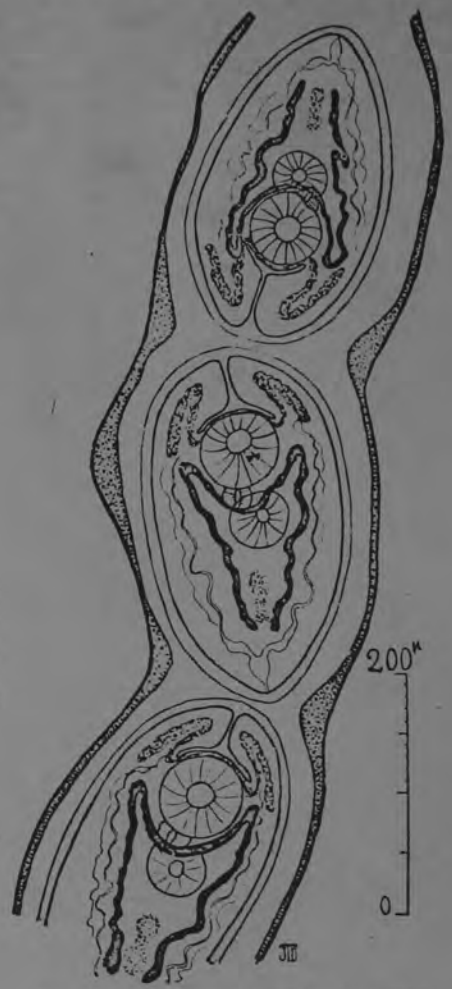


FIG. 17. — Portion d'un tube de sporocyste (160 jours) renfermant trois métacercaires enkystées. Aspect moniliforme. (Microprojection).

L'observation d'une série d'individus m'a permis de constater que le rythme est de l'ordre de 4 à 7 systoles par minute, à la température du laboratoire (18 à 20°).

Les métacercaires

La formation des métacercaires s'accompagne de changements morphologiques très apparents : 1° la dépression, puis l'invagination de la partie antérieure du corps ; 2° l'élaboration d'une épaisse

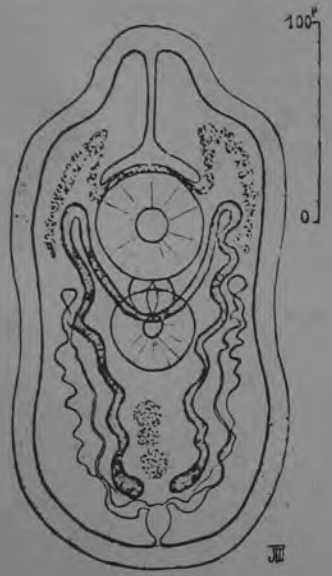


Fig. 14. — Métacercaire récemment enkystée (128 jours). Microprojection.
Fig. 15. — Métacercaire complètement mûre (175 jours). Microprojection.

couche de substance mucoïde qui constitue l'enveloppe de la forme enkystée.

L'allure très caractéristique de la métacercaire est commandée par le déplacement de la ventouse orale qui s'enfonce profondément, entraînant le pharynx et la portion proximale des cæcums pour venir se placer au contact de l'acetabulum (fig. 14). Ce processus, qui est absolument constant chez tous les sujets, entraîne naturellement des changements dans les dimensions du corps, avec

L'observation dans une goutte de sérum humain a été utilisée avec avantage. De la vessie sphérique se détachent les deux troncs principaux qui sont fortement dilatés en ampoule à leur point de départ, ce qui donne à l'ensemble un aspect en Y. Ces canaux, qui sont très larges dans la première partie de leur trajet, se dirigent en avant en suivant le bord externe du cæcum, puis dessinent une anse rétrograde (type Sténostome), qui se situe à peu de distance du pharynx. La branche récurrente croise la branche ascendante qu'elle accompagne de son côté externe, puis la croise à nouveau vers l'extrémité du cæcum qu'elle contourne. Un certain nombre de flammes vibratiles ont été observées, mais leur arrangement détaillé n'a pu être précisé. Il n'a pas été possible d'établir la formule.

Chez les sujets examinés en solution isotonique (Ringer glucosé), j'ai observé des contractions de la vessie selon un rythme très régulier : ces mouvements (fig. 13) s'exécutent par rapprochement des parois latérales, d'abord en avant et ensuite en arrière. Ces systoles n'affectent que la vessie elle-même et n'intéressent jamais les ampoules qui sont à la base des deux troncs primaires.

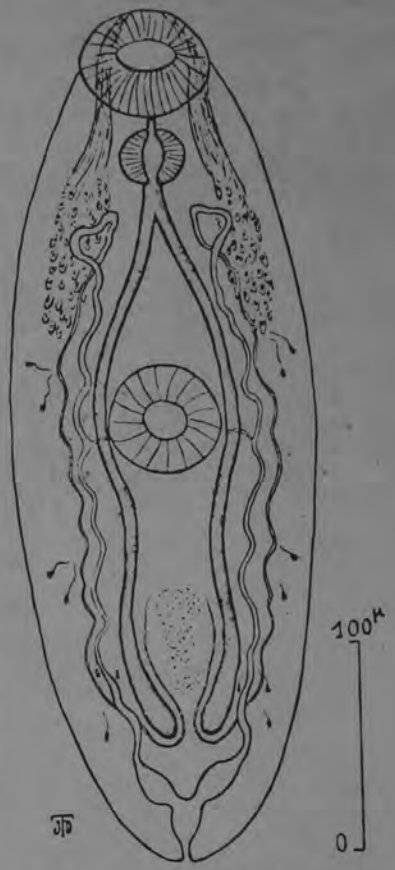


Fig. 12. — Cercaire complètement développée (61 jours).

Fig. 13. — Aspects comparés de la vessie en diastole (à gauche) et en systole.

A partir de 65 jours, les sporocystes renferment en abondance des cercaires complètement développées (fig. 12). Ce sont des cercaires sans queue, du type *Leucochloridium*. Voici leurs dimensions moyennes, mesurées sur des sujets en extension, sous lamelle : longueur : 423 µ ; largeur : 144 µ ; ventouse orale : 63 µ ; acetabulum : 54 µ ; pharynx : 29,7 µ. L'acetabulum est situé sensiblement au milieu du corps. Certains sujets montrent un très court prépharynx ; l'œsophage est inexistant ou extrêmement court. Les cæcums se colorent électivement par le rouge neutre ; ils s'étendent très loin en arrière et se terminent à environ 50 µ de l'extrémité postérieure du corps.

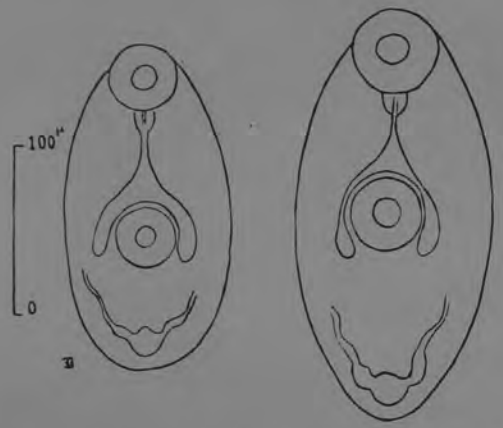


Fig. 11. — Jeunes cercaires (46 jours), montrant le tube digestif encore incomplètement développé, les cæcums très courts entourant l'acetabulum.

Les gonades sont encore peu distinctes ; leur emplacement correspond à un territoire plus basophile, situé dans l'axe du corps, entre les deux cæcums, peu avant leur terminaison.

Il existe deux groupes de glandes céphaliques bien développées, disposées symétriquement de chaque côté entre le pharynx et l'acetabulum. Les canaux qui en proviennent se dirigent en avant et viennent déboucher au bord antérieur de la ventouse orale. Ces glandes sont formées d'un grand nombre d'éléments ovales (13 µ × 8 à 9 µ), qui se colorent par le rouge neutre.

L'appareil excréteur a été étudié sans coloration, chez les cercaires mourantes, légèrement comprimées par le poids de la lamelle.

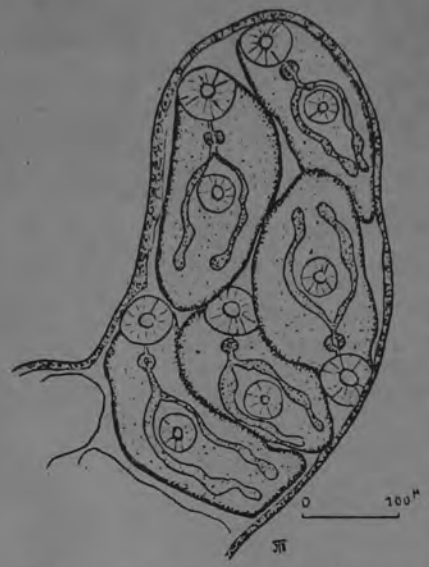


Fig. 8. — Extrémité d'un tube de sporocyste (68 jours) bourré de cercaires étroitement juxtaposées. (Microprojection).

laire dont les éléments ne sont pas toujours en continuité ; cette couche se renforce et devient pluristratifiée dans les culs-de-sac terminaux des diverticules du sporocyste.

Sur les coupes de l'hépato-pancréas parasité, les territoires correspondant aux sporocystes et à leur contenu se distinguent au premier coup d'œil par leur basophilie intense qui contraste avec la teinte claire des acini beaucoup moins chromophiles.

Je n'ai jamais observé la présence de diverticules pigmentés, ni leur extension en dehors de l'hépato-pancréas ; en particulier, les tentacules du Mollusque ne sont jamais envahis par des « brood-sacs », comme c'est le cas pour *Leucochloridium* et *Neoleucochloridium*.

Les cercaires

Les premières cercaires sont reconnaissables 45 jours après la contamination, mais elles sont encore rares à ce moment : les sporocystes renferment surtout un grand nombre de masses embryonnaires arrondies.

Les plus petites parmi ces jeunes cercaires mesurent 200 × 100 µ ; le diamètre de la ventouse orale atteint 38 µ, celui de l'acetabulum 36 µ. Le tube digestif est bien visible, mais les cæcums sont très courts, entourant l'acetabulum dont ils ne dépassent pas le bord postérieur (fig. 11). Chez les formes de 350 µ, ils sont un peu plus longs. Le pharynx est indiqué par un renflement peu accusé ; l'appareil glandulaire n'est pas encore apparent ; la vessie et les deux troncs principaux sont bien visibles.

Les sporocystes of *U. tholonetensis* from T-D (1957)

Les sporocystes sont déjà assez grands 45 jours après la contamination (fig. 2) ; ils mesurent à ce moment 0,8 à 1,2 mm. Ces organismes sont constitués par des tubes très irréguliers, branchus et ramifiés, dont le diamètre très variable est compris entre 45 et 110 µ ; leur longueur est aussi très inégale ; beaucoup se terminent par des renflements en massue (fig. 4) ; leur couleur est uniformément blanche ; ils ne montrent aucun mouvement. Il est assez facile de les dégager entre les acini de l'hépato-pancréas en dissociant la masse sous le contrôle du binoculaire ; leur contenu, à ce stade, est

rares cercaires commencent bientôt à être reconnaissables (fig. 7). A ce stade, les lobes de l'hépato-pancréas ne présentent pas encore de lésions très accusées : on y observe surtout des phénomènes de tassement et de compression au contact des branches du parasite.

La taille du sporocyste continue à croître, atteignant environ 2 mm. entre 65 et 70 jours. A ce moment, les tubes renferment de nombreuses cercaires qui présentent des mouvements très actifs (fig. 8). La taille du sporocyste atteint 4,3 mm. au bout de 113 jours (fig. 9). Un sporocyste de cet âge renferme une centaine de cercaires (fig. 10).

L'observation des coupes montre que la paroi du sporocyste est constituée par une cuticule épaisse de 2 µ qui est riche en polysaccharides : la réaction au P.A.S. selon Hotchkiss-Mc Manus est franchement positive. Cette cuticule est tapissée intérieurement par un très mince revêtement musculaire, doublé d'une couche cellu-

représenté par des embryons de cercaires qui affectent la forme d'amas cellulaires sphériques ou ovoïdes, de dimensions inégales : le diamètre des plus petits est voisin de 30 µ ; celui des plus gros de 70 µ ; les cellules mesurent 4 à 5 µ ; elles se colorent intensément

Fig. 2. — Sporocystes d'*Urotocus tholonetensis* T.-D. âgés de 45 jours. Dessin d'après microprojection.

par le rouge neutre. Les coupes montrent nettement comment ces sphères embryonnaires prennent naissance par prolifération de la couche cellulaire de la paroi du sporocyste (fig. 5 et 6). En certains points, on peut voir les amas embryonnaires en continuité avec la couche pariétale dont ils se détachent progressivement. Quelques

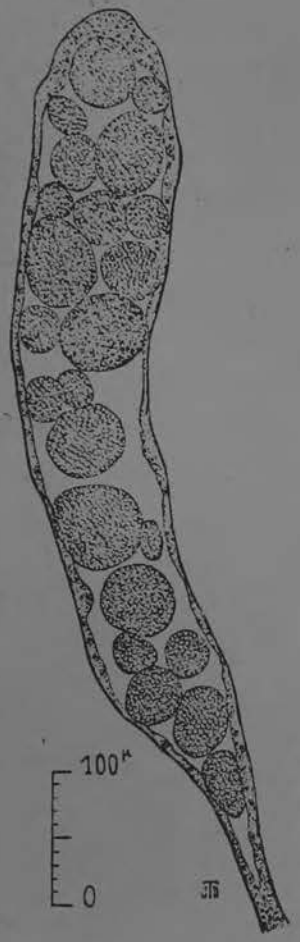


Fig. 6. — Structure d'un tube de sporocyste (47 jours) renfermant de nombreuses sphères embryonnaires. (Microprojection).

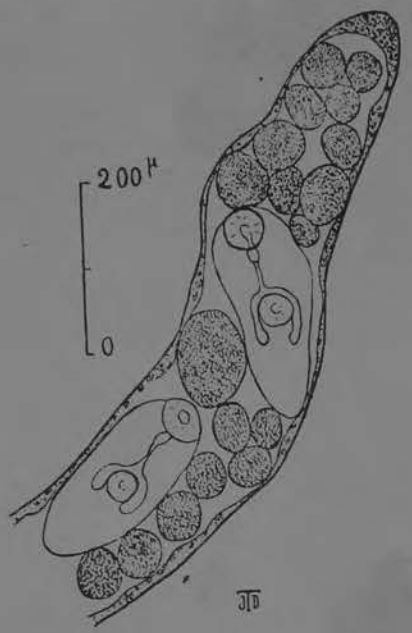


Fig. 7. — Extrémité d'un tube de sporocyste (62 jours) renfermant deux jeunes cercaires à côté de nombreuses sphères embryonnaires. (Microprojection).

SUBFAMILY UROTOCINAE YAMAGUTI, 1958

Urotocinae Yamaguti, 1958

Subfamily diagnosis: Leucochloridiidae. Body small, elongate, linguiform or fusiform, rounded at two extremities. Oral sucker comparatively small; pharynx small; esophagus absent; ceca very wide, reaching to near posterior extremity. Acetabulum very small, in second quarter of body, or absent. Testes rounded, median, tandem, in posterior third of body. Cirrus pouch very small. Genital pore terminal. Ovary intertesticular. Seminal receptacle present; Laurer's canal absent. Uterine coils occupying whole intercecal field between intestinal bifurcation and testes, not overreaching ceca laterally.

- Yamaguti (1971)

Urotocinae n. subfam.

Subfamily diagnosis. — Leucochloridiidae: Body elongate, tongue-shaped. Suckers weakly developed, especially acetabulum very small, pre-equatorial. Esophagus absent, ceca reaching to near posterior extremity. Testes tandem, in posterior third of body. Cirrus pouch small. Ovary intertesticular. Vitellaria extending in lateral fields of fore- and hindbody. Uterus occupying whole intercecal field between intestinal bifurcation and anterior testis. Excretory vesicle?

- Yamaguti (1958)

Urotocus Looss, 1899

Generic diagnosis: Leucochloridiidae, Urotocinae, with characters of the subfamily.

Type species: *U. rossittensis* (Mühling, 1898) Looss, 1899 (Fig. 1183), in *Turdus pilaris*; Prussia. Also in *Anthus spinoletta petrosus*, Brit. Is.; *Prunella modularis*; Russia. Williams (1960) redescribed this species from British material from *Anthus* and concluded that *rossittensis*, *fusiformis* and *tholonetensis* are probably identical 2.25 X 0.33 (30.6-32.4 X 17-18) in Witenberg (1925). -Yamaguti (1971)

GENUS UROTOCUS LOOSS, 1899

(Urotocinae)

Generic diagnosis from Kagan (1952):

Leucochloridiinae: Body elongate, fusiform. Suckers weakly developed, acetabulum sometimes absent. Cuticula spinose. Pharynx small. Genital glands in line in posterior fourth of body. Genital pore terminal or subterminal on ventral surface. Cirrus sac small. Cirrus short. Receptaculum seminis absent. Laurer's canal present. Vitellaria extracecal, extending posteriorly to level of ovary. Uterus intracecal, extending nearly to pharynx. Eggs small. Parasites in Bursa of Fabricius of passerine birds. Type species, U. rossitensis (Mühling, 1898). Additional species U. fusiformis McIntosh, 1935.

Urotocus Looss, 1899

Generic diagnosis. — Leucochloridiidae, Urotocinae: Body small, tongue-shaped, rounded at two extremities. Oral sucker comparatively small. Pharynx small; esophagus absent, ceca very wide, reaching to near posterior extremity. Acetabulum very small, in second quarter of body. Testes rounded, median, tandem, in posterior third of body. Cirrus pouch small. Genital pore terminal. Ovary intertesticular. Receptaculum seminis absent. Laurer's canal present. Uterine coils occupying whole intercecal field between intestinal bifurcation and anterior testis, not overreaching ceca laterally; eggs very numerous, small. Vitellaria extending in extracecal fields except for two extremities. Parasitic in bursa Fabricii of birds.

Genotype: ***U. rosittensis*** **(Mühl., 1898) Looss, 1899 (Pl. 71, Fig. 858), in** ***Turdus pilaris;*** **Prussia. Also in** ***Prunella modularis;*** Russia.

Other species: ***U. fusiformis*** **McIntosh, 1935, in** ***Oporornis philadelphia;*** **U.S.A. Also in** ***Vireo griseus, Dendroica magnolia, Geothlypis trichas;*** **Washington, D.C.**

↑Yamaguti (1958)

Timon-David (1957)

Les trois espèces connues d'*Urotocus* sont toutes localisées dans la bourse de Fabricius des Oiseaux ; elles peuvent être distinguées d'après les caractères suivants :

1. Acetabulum absent..... *U. fusiformis* McIntosh
— Acetabulum présent 2
2. Cæcums dépassant longuement le testicule postérieur ; testicule antérieur atteignant presque le milieu du corps..... ..... *U. tholonetensis* Timon-David
— Cæcums dépassant à peine le testicule postérieur ; testicule antérieur atteignant seulement les 2/7 du corps.. *U. rossittensis* (Mühling)

←Timon-David (1955)

Discussion

Urotocus tholonetensis se distingue facilement d'*U. rossittensis* (Mühling) et d'*U. fusiformis* Mc Intosh par un ensemble de caractères importants. Voici quelles sont les principales différences avec *U. rossittensis* :

-Timon-David (1955)

L'acétabulum a une situation beaucoup plus antérieure : un cinquième du corps, tandis qu'elle est voisine du tiers chez *rossittensis*. Les gonades sont situées plus en avant, pouvant atteindre le milieu du corps (entre le tiers et le quart chez *rossittensis*) ; les branches intestinales se prolongent loin en arrière du testicule postérieur ; leurs extrémités dilatées en sacs arrivent souvent au contact ; l'asymétrie est fréquente. L'extension des vitellogènes est plus grande en avant. Taille plus grande (près du double). Hôte et distribution géographique différents.

Urotocus fusiformis diffère essentiellement d'*U. tholonetensis* par la forme générale et par l'absence totale d'acétabulum, par la situation relative des gonades qui ne dépassent pas en avant les 2/7 du corps, par la forme des œufs qui sont plus globuleux (28 × 20 µ), par l'hôte et la distribution géographique.

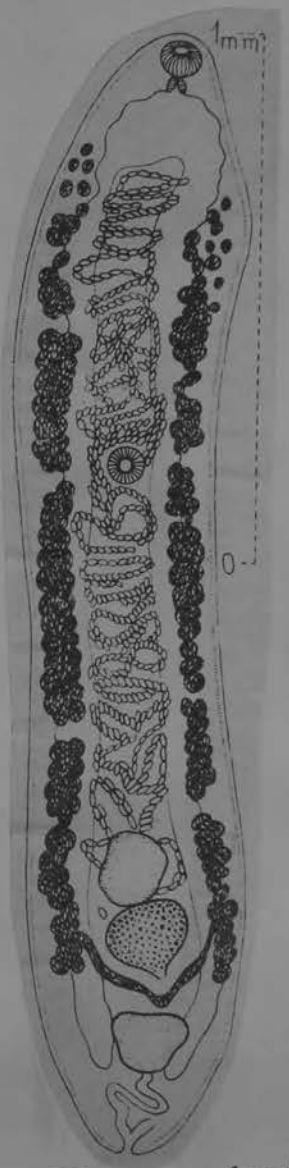
Ces différences sont résumées dans le tableau suivant :

	Urotocus tholonetensis sp. nov.	*Urotocus rossittensis* Muehling	*Urotocus fusiformis* McIntosh
Longueur	3,2 à 4,4 mm. (moyenne 3,9)	2,26 mm.	5 mm.
Ventouse orale	104 à 110 µ	71,3 à 73,8 µ	104 à 110 µ
Pharynx	60 à 75 µ	50,4 µ	46 à 70 µ
Acetabulum	80 à 85 µ	58 µ	manque
Situation de l'acetabulum	1/5 du corps	3/8	»
Limite du testicule antérieur	Atteignant presque le milieu du corps	2/7	2/7
Cæcums	Dépassant longuement le testicule postérieur	Dépassant à peine le testicule postérieur	Dépassant longuement le testicule postérieur
Limite antérieure des vitellogènes	Atteignant presque le pharynx	Bien en arrière de la bifurcation du tube digestif	Atteignantpresque le pharynx
Ovaire	250 à 300 µ	155 µ	245 à 260 µ × 350 à 380 µ
Testicule antérieur	230 à 450 µ	158 µ	285 à 320 µ × 300 à 370 µ
Testicule postérieur	380 à 550 µ	122 µ	212 à 290 µ × 300 à 320 µ
Œufs	26 à 28 µ × 16 µ	30,6 à 3 ,4 µ 17 à 18 µ	28 × 20 µ
Hôte	*Pica pica* (L.)	*Turdus pilaris* L.	*Oporornis philadelphia* (Wilson)
Localité	Le Tholonet (B. du Rh.)	Rossitten (Prusse)	Washington (U.S.A.)

[TYPE SPECIES]

Urotocus rossittensis (Muehling, 1898) Looss, 1899

syn: Urogonimus rossittensis Muehling, 1898



Timon-David (1955)
after Skrjabin (1948)

id

Leucochloriidae

Urotocus crecci ~~n. sp.~~ BHUTTA AND KHAN, 1975

(Fig. 59)

The following description is based upon a single worm recovered from the bursa Fabrici of one out two specimens of *Anas crecca*, collected from Lahore.

The body of the worm is spatulate, with maximum breadth a short distance in front of the posterior extremity. Both the extremities are broadly rounded. The tegument is devoid of any armature. The oral sucker is poorly muscular, terminal and spherical. The ventral sucker is situated nearer the anterior extremity, at a distance of 0.999 mm. It is very small in relation to the body size of the worm and much smaller than the oral sucker. The prepharynx is very short. The golobular pharynx is well-developed and larger than the oral sucker. The oesophagus is very short. The caeca are wide and terminate near the posterior extremity.

59

The gonads are intercaecal, lying near the posterior end of the body. The testes are rounded to oval structures, diagonally placed at a distance of 0.666 mm from one another. The anterior testis is submedian, while the posterior testis is median and situated at a distance of 0.484 mm from the posterior extremity. The cirrus sac is small. The genital aperture is terminal. The ovary is situated in front of the posterior testis and slightly to the left of the median line, at a distance of 0.098 mm from the posterior testis. The Mehlis' gland lies behind the ovary. The vitellaria are in the form of a large number of rounded to oval follicles of small size, distributed irregularly along the extra-caecal fields. Mainly they are extra-caecal in position but at certain places they surround the caeca. Anteriorly they extend to the level of the anterior margin of the ventral sucker, while posteriorly they almost reach the posterior end of the body. The uterus is very extensive occupying the intercaecal space, extending between the intestinal fork and the ovary.

MEASUREMENTS

(All measurements in millimetres)

Body length	6.665
Body width	1.606
Oral sucker	0.176×0.176
Ventral sucker	0.071×0.076
Pharynx	0.313×0.294
Ovary	0.245×0.225
Mehlis' gland	0.294×0.294
Anterior testis	0.362×0.254
Posterior testis	0.392×0.313

Host: *Anas crecca*
Location: Bursa Fabricii
Locality: Lahore

DISCUSSION

The species under present study differs from *U. rossittensis* in complete absence of the body spines, in its pharnx being comparatively larger, in the relative position of the ventral sucker which is nearer the anterior end in the present species, in the extent of the vitellaria which extend beyond the posterior testis in the present species, in the diagonal position of the two testes and in displacement of ovary to one side away from the median line. In view of all these differences it is obvious that a new species is being dealt with for which the name, *Urotocus crecci* is proposed.

Urotocus fusiformis McIntosh, 1935

Description.—Body fusiform (fig. 1), flat, spiny, 5 mm. long by 1.45 mm. wide uator, broadest at equatorial zone and tapering towards extremities. Oral r terminal or slightly subterminal, 70 μ by 100 μ. Prepharynx short, 20 μ μ, pharynx 46 μ by 70 μ, surrounded by glandular mass; esophagus shorter prepharynx, 10 μ by 30 μ; intestinal crura approximately parallel to lateral in of body and terminating near posterior extremity, each branch filled with colored substance, apparently undigested blood of host. Acetabulum ap- tly absent, not observed in either living or fixed material. Excretory pore inal. Testes and ovary tandem, in posterior fourth of body. Testes oval or rical, usually wider than long; anterior testis 285 μ to 320 μ by 300 μ to 370 μ; rior testis 212 μ to 260 μ by 300 μ to 320 μ. Cirrus pouch 250 μ by 50 μ; s 150 μ long. Genital pore ventral and subterminal, about 80 μ from poste- end of body. Ovary 245 μ to 260 μ by 350 μ to 380 μ, between testes and cent to anterior testis. Mehlis' gland 120 μ by 270 μ, between ovary and rior testis; Laurer's canal present. Vitellaria extracecal, extending from tly posterior to zone of pharynx to zone of ovary. Metraterm well devel- , lateral to cirrus pouch; uterus filled with eggs, ascending portion consisting umerous coils, greatly distended with newly formed, light colored eggs, ex- ng transversely across body, occupying all space between branches of crura with some coils overlapping crura; descending portion of uterus ventral to ding portion, with less extensive coils, filled with very dark brown eggs ing this part of uterus conspicuous and easy to trace in its course to poste- end of body. Eggs 28 μ by 20 μ.

Type specimen.—U. S. N. M. Helm. Coll. No. 34309.

Habitat.—Bursa Fabricii of *Oporornis philadelphia* (Wilson), Washington,

FIG. 1. *Urotocus fusiformis* n. sp. *a*. Complete specimen, ventral aspect; *b*, Posterior extremity, dorsal aspect.

Remarks.—Urotocus fusiformis is closely related to *U. rossitensis* (Muhling, 1898), the genotype and only other species of the genus. The two species may be separated as follows: *U. fusiformis* is spindle shaped, apparently has no acetabulum, and the posterior testis is removed from the tips of the crura by a distance equal to its diameter while *U. rossitensis* is oblong, has an acetabulum, and the posterior testis is between the tips of the crura. The species of the genus *Urotocus* are related to the members of the genus *Leucochloridium* in the general morphology of the reproductive system. However, the general topography of the body is very different from that of any member of that genus. In *Leucochloridium* the suckers are large and powerful, thus aiding the worm in adhering to the mucosa of the rectum. In *Urotocus* the suckers are weakly developed (the acetabulum in *U. fusiformis* is apparently absent) a fact which may be correlated with the habitat of the fluke, there being little need for strong suckers in flukes living in a sac-like structure, such as the bursa Fabricii.—ALLEN MCINTOSH, *Zoological Division, Bureau of Animal Industry, Washington, D. C.*

Urotocus fusiformis MCINTOSH, 1935 (Fig. 26)

Host: *Cassidix mesamexicanus* (Gmelin), boat-tailed grackle (new host record).

Location: Bursa Fabricii.

Locality: Goodhope oil field, near Norco, Louisiana (new locality record).

Discussion. MCINTOSH (1935) named and described *Urotocus fusiformis* from *Oporornis philadelphia* in Washington, D. C., YAMAGUTI (1958) cited *Vireo griseus*, *Dendroica magnolia* and *Geothylpis trichas* as additional hosts for this trematode. McIntosh (1935) distinguished *U. fusiformis* from *U. rosittensis* (Muhl. 1898) Looss, 1899, the genotype, by body shape (spindleshaped in *U. fusiformis*, oblong in *U. rosittensis*), absence of an acetabulum in *U. fusiformis* and position of the posterior testis (at the terminal ends of the ceca in *U. fusiformis*, further anterior in *U. rosittensis*). Over 100 specimens of *U. fusiformis* recovered from a grackle, *Cassidix mesamexicanus*, collected at the Goodhope oil field, Louisiana, agree in all details with MCINTOSH's (1935) description of this species.

From: Lumsden & Zischke 1963

Urotocus tholonetensis Timon-David, 1955

Description

Corps aplati, atténué aux deux extrémités. La longueur totale varie de 3,2 à 4,4 mm. (moyenne mesurée sur 16 sujets : 3,9 mm.). La largeur maxima (0,6 à 1 mm.) est située vers le cinquième antérieur. Ventouses faibles : orale : 104 à 110 µ ; ventrale plus petite : 80 à 85 µ, située à la hauteur du cinquième antérieur du corps. Cette dernière ventouse est pratiquement invisible sur les préparations totales examinées par transparence, car elle est masquée par les circonvolutions utérines bourrées d'œufs ; mais j'ai pu l'observer très nettement sur les coupes en série ; j'ai pu également la voir sur des sujets vivants examinés sous éclairage direct. Cuticule peu épaisse, couverte d'épines de 12 à 15 µ.

Tube digestif : pharynx accolé à la ventouse orale, sans prépharynx (longueur, 60 à 75 µ ; largeur, 60 à 75 µ). L'œsophage manque en général (fig. 1) ; cependant, certains sujets en montrent un très court (30 µ). Les branches intestinales s'étendent très loin et se terminent à peu de distance de l'extrémité postérieure ; elles sont très larges et se dilatent en formant un renflement en sac ; leur trajet irrégulier présente souvent des dilatations en ampoules séparées par des constrictions ; elles entourent étroitement le testicule postérieur et se prolongent sur un parcours de 350 à 600 µ au-delà de son bord postérieur ; leurs renflements terminaux sont fréquemment en contact par leurs bords internes. J'ai observé bien souvent une dissymétrie prononcée, un cæcum étant beaucoup plus long que l'autre : l'écart, chez un même sujet, peut atteindre 300 µ (fig. 3).

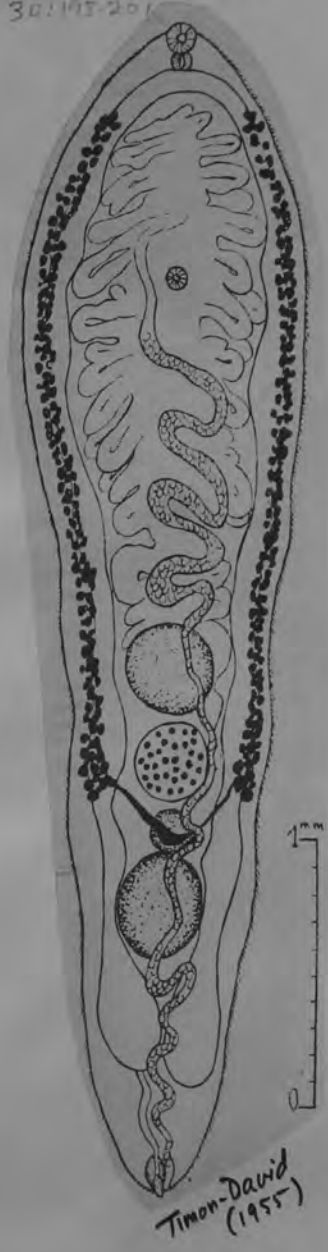
Le tube digestif est toujours rempli de débris de couleur noirâtre, qui paraissent représenter du sang partiellement digéré.

Organes génitaux : les gonades sont alignées en ligne droite dans l'axe du corps, l'ovaire entre les deux testicules. Le bord antérieur du premier testicule atteint les deux cinquièmes et même souvent le milieu du corps. Ovaire arrondi (diamètre, 250 à 300 µ). Testicule antérieur arrondi (230 à 450 µ) ; postérieur le plus souvent elliptique, à grand axe longitudinal (380 à 550 µ). Vésicule séminale sinueuse, large de 40 à 45 µ ; poche du cirre ovoïde (140 × 100 µ), accolée au métraterme. Cirre terminal, peu développé.

Les vitellogènes sont formés de très nombreux follicules alignés latéralement en dehors et en arrière de chaque cæcum ; leur limite postérieure correspond au milieu ou au bord postérieur de l'ovaire ; leur limite antérieure atteint presque la même extension que l'utérus. Les vitelloductes transverses décrivent une anse à concavité antérieure située entre l'ovaire et le testicule postérieur. Glande de Mehlis médiane ; pas de réceptacle séminal.

L'utérus décrit de nombreuses circonvolutions bourrées d'œufs innombrables et n'empiète pas sur les branches intestinales ; il se porte dorsalement d'arrière en avant jusqu'à proximité de la bifurcation cæcale, un peu en arrière du pharynx, puis revient en arrière en suivant un trajet ventral et sinueux, passe au-devant des testicules et de l'ovaire et s'insinue en avant des renflements cæcaux. Orifice génital terminal. Cette portion renferme des œufs à paroi foncée qui mesurent 26 à 28 µ sur 16 µ.

La vessie est située dorsalement par rapport au métraterme et à la vésicule séminale ; la structure de l'appareil excréteur n'a pu être étudiée.



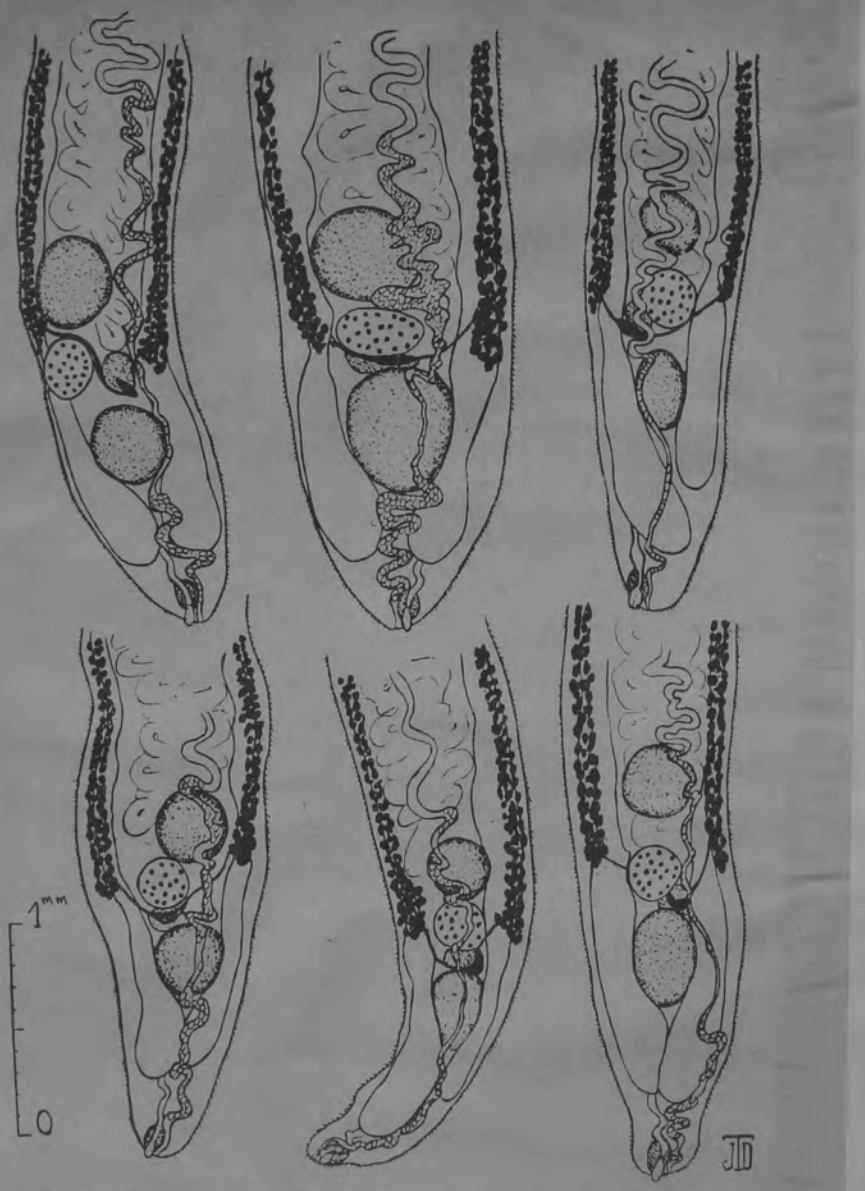


FIG. 3. — *Urotocus tholonetensis* nov. sp. Dessin d'après microprojection, montrant les variations individuelles chez six sujets vus ventralement. On remarquera la dissymétrie plus ou moins accusée dans la terminaison des branches intestinales.

UROTOCUS

SUBFAMILY URORYGMINAE YAMAGUTI, 1958

Subfamily diagnosis: Leucochloridiidae. Body very small, elongate oval, unspined. Oral sucker terminal, very large; pharynx muscular, large; esophagus practically absent; ceca reaching to posterior extremity. Acetabulum very large, postequatorial. Testes rounded, juxtaposed in forebody between ceca and acetabulum. Seminal vesicle surrounded by conspicuous circular muscle fibers. Genital pore at posterior extremity. Ovary oval, approximately median, dorsal to acetabulum, posttesticular. No seminal receptacle. Vitellaria extending in lateral fields of forebody. Uterine coils overreaching ceca laterally; eggs small, numerous. Excretory system unknown. Parasites of birds.

-Yamaguti (1971)

Genus Urorygma Braun, 1901

Urorygma Braun, 1901

Generic diagnosis: Leucochloridiidae, Urorygminae with characters of the subfamily.

Type species: *U. nanodes* Braun, 1901 (Fig. 1177), in *Falco nitidus;* Brazil. 0.8-1.0 X 0.4 (28 X 18.3-23)—Braun (1902).

– Yamaguti (1971)

Urorygminae n. subfam.

Subfamily diagnosis. — Leucochloridiidae: Body elongate oval, unspined. Oral sucker and pharynx very large. Esophagus absent, ceca reaching to posterior extremity. Acetabulum very large, postequatorial. Testes juxtaposed in forebody. Seminal vesicle provided with conspicuous circular muscle. Cirrus pouch? Ovary dorsal to acetabulum, posttesticular. Vitellaria in lateral fields of forebody. Uterus overreaching ceca laterally. Excretory vesicle?

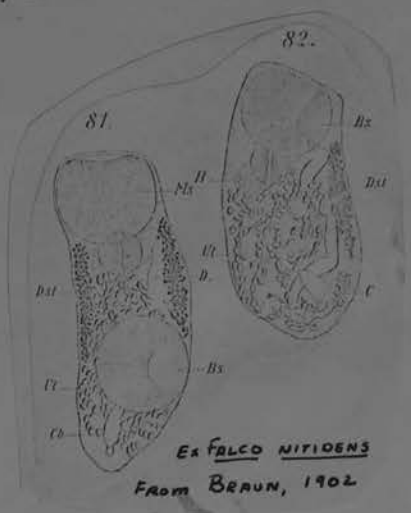
Urorygma Braun, 1901

Generic diagnosis. — Leucochloridiidae, Urorygminae: Body very small, elongate oval, unspined. Oral sucker terminal, very large, followed by muscular pharynx. Esophagus practically lacking; ceca reaching to posterior extremity. Acetabulum very large, postequatorial. Testes rounded, juxtaposed between commencement of intestine and acetabulum. Seminal vesicle surrounded by conspicuous circular muscle fibers. Genital pore at posterior extremity. Ovary oval, approximately median, dorsal to acetabulum, posttesticular. No receptaculum seminis. Vitellaria extending in lateral fields of forebody. Uterine coils overreaching ceca laterally; eggs small, numerous. Excretory system? Parasites of birds.

Genotype: *U. nanodes* Braun, 1901 (Pl. 79, Fig. 958), in *Falco nitidus;* Brazil.

– Yamaguti (1958)

Urorygma nanodes Braun, 1901



Ex FALCO NITIDENS
FROM BRAUN, 1902

URORYGMA